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# USSR Report

## TRANSPORTATION

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# USSR REPORT

## TRANSPORTATION

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CIVIL AVIATION

# AEROFLOT OFFICIALS' ROUNDTABLE ON SECTOR'S TECHNICAL PROGRESS

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 2, Feb 86 pp 30-33

[Materials from a roundtable discussion prepared by GRAZHDANSKAYA AVIATSIYA special correspondents S. Sokolov and I. Kazanskiy: "On the Path of Scientific and Technical Progress: Reserves of Indust / Science--A Journal Roundtable Discussion"; first paragraph is GRAZHDANSKAYA AVIATSIYA introduction]

[Text] The resolution of the key task of the 12th Five-Year Plan--the utmost acceleration of scientific and technical progress and an increase in the role of science and technology in transferring the industry onto the rails of the all-round intensification and raising of the efficiency and quality of air transportation--is the theme of the roundtable discussion published in this issue of the journal. Participating in the discussion were Leonid Gavrilovich Verkhovin, chief of the Scientific and Technical Main Administration and collegium member of the Ministry of Civil Aviation [MGA], Viktor Vasilyevich Gorlov, deputy chief of GosNII GA [State Scientific Research Institute of Civil Aviation], Yurij Mikhaylovich Fedorov, first deputy chief of the NETs [Scientific and Experimental Center] of the AUVD [Air Traffic Control Administration], Vladimir Dmitriyevich Kasyanchik, deputy chief of the Economic Planning Main Administration, Anatoliy Pavlovich Nikitin, deputy chief of the Operations and Repair of Aviation Technical Equipment Main Administration, Viktor Antonovich Parkhimovich, deputy chief of the Education and Training Establishments Administration, Igor Vladimirovich Nosenko, deputy chief of the Aviaremont [Aviation Repair] All-Union State Industrial Association, Vladimir Ivanovich Chernikov, deputy chief of the Aviaproyekt [Aviation Planning] GPIiNII [State Planning and Scientific Research Institute] and Aleksandr Rodionovich Pashchenko, chief of the Aviation and Technical Base of the TsUMVS [International Air Services Central Administration]

[Verkhovin] In beginning our discussion, I would like to note that the scientific subunits of the industry are carrying out outstanding work on accelerating scientific and technical progress and incorporating its achievements into production. An average of more than 500 scientific research projects are conducted every year aimed at increasing the efficiency of industry activity and the quality of operations and ensuring flight safety and fuel- and energy-resource conservation. The average annual economic saving from the incorporation of these projects over the five-year plan was approximately 2.8 rubles for every ruble of expenditure, and the economic saving reached 200 million rubles.

But there remains much that must be done. The plan of measures adopted by the ministry Collegium for accelerating scientific and technical progress in civil aviation stipulates providing for practically the entire growth in operations volume by increasing labor productivity and obtaining an average annual economic saving of approximately 400,000 tons of standard fuel. At the same time, it is projected that the time spent on conducting and incorporating scientific research and experimental design work will decrease and that conditions will be created to transfer industry enterprises and organizations to a new and improved management system.

[Editors] One should not, of course, deny the successes. As is said, what's done is money in the bank. But there are evidently many reserves that have not been utilized. It seems that our discussion today should be oriented toward the discussion of unresolved issues. Isn't that so?

[Verkhovin] Undoubtedly. Moreover, if the issue is reserves, then they lie first and foremost in the creation of new future aviation equipment. The final characteristics of new aircraft and helicopters depends greatly both on the development of technically and economically based requirements by the specialists of industry science and on their realization in practice. Recently, the work of GosNII, NETs AUVD, Aviaproyekt, GlavUREO [Avionics Main Administration] and GlavNTU [Scientific and Technical Main Administration] was criticized at a ministry Collegium session on issues of scientific support for creating new equipment, equipping aircraft on local lines and helicopters with objective monitoring equipment, developing diagnostic and continuous-monitoring equipment and increasing the role of state and operational testing. We must eliminate all of these shortcomings in the shortest possible time.

One area of scientific and technical progress is modernizing the aircraft and helicopters currently in operation. Such work is being conducted, but frequently greatly lags established time frames. On the issue of increasing the level of flight safety, the inadequate scope of research on the personality factor on the effectiveness of the operation of the "man--machine" system must be noted.

We must continue to improve the unified air traffic control system, accelerating the incorporation of automated systems, reduce the share of manual labor in production while raising the quality of mechanization equipment, and earnestly pursue the automation of production processes in aircraft equipment maintenance and repair. Problems of linking science with production, as well as utilizing the scientific potential of higher educational institutions, are advanced to the foreground.

I think that the issues raised touch, in the first place, on the activity of the leading scientific center of the industry--the State Scientific Research Institute of Civil Aviation. We give the floor to its representative.

[Gorlov] Our institute is planning research on scientific support for the creation, and on the conducting, of testing as well as on the incorporation into operation of new aircraft and helicopters as stipulated by the

Fundamental Areas of Economic and Social Development of the USSR in the 12th Five-Year Plan and for the period to the year 2000. Newly created passenger aircraft should significantly exceed those currently operating in civil aviation in weight perfection--by 1.2-1.5 times--and in fuel efficiency--by 1.5-1.8 times. They will be equipped with the most modern piloting and navigational complexes and will allow the use of progressive forms of technical operation and repair. A reduction in their idle time will ensure a considerable increase in annual flying per average registered aircraft.

All the new helicopters should also surpass those now operating in civil aviation in their technical flight characteristics. They will be distinguished by improved piloting and navigational equipment, powerful and efficient engines, and new design solutions and materials. This will make it possible to improve indicators of flight regularity and safety, expand the sphere of application of helicopters and their utilization in difficult meteorological conditions, and improve fleet economic indicators.

The entry into service of the new-generation aircraft and helicopters requires serious and timely preparation in all services of the industry, especially the aviation-engineering and flight services. In this regard, the task before our institute is to raise significantly the level of research associated with technical diagnostics and failure prediction, the incorporation of equipment and methods for continuous monitoring, the search for rational operational and repair enterprise structures, the incorporation of computer technology and mechanization equipment in service and repair processes and the development and incorporation of simulation complexes. Specialists of the NETs of the AUVD, Aviaproyekt and industry higher educational institutions should be attracted to this work.

We realize that under the new conditions the GosNII collective must significantly improve work on scientific support for the creation of new aviation equipment, make interaction with industry more active, and have a greater effect on accelerating the course of aircraft modernization. It is also necessary to strengthen contacts with operational and repair enterprises and make broader use of their material base for research and experiments. The efforts of our collective are now directed toward increasing the efficiency of these areas of activity.

The transition, beginning in 1987, to a profit-and-loss system of accounting for organizing the operations of creating and incorporating new equipment will be an important means of accelerating scientific and technical progress.

The resolution of these problems will make possible a substantial increase in the efficiency of scientific research and the achievement of a return of four rubles on every ruble spent on science by the end of the five-year plan.

[Fedorov] The NETs of the AUVD is also taking part in the development of new equipment. We speak here of air-traffic control [ATC] systems and on-board piloting and navigational equipment. On the agenda today are the problems of incorporating a new generation of automated ATC systems with increased levels of automation (and especially with the capability to detect conflicting situations), as well as satellite systems, microwave landing systems,

emergency situation warning systems and on-board digital piloting and navigational complexes.

These problems are multifaceted and their resolution requires the improvement of the unified ATC system structure, the development of its technical base and study of the personality factor. By the way, it should be said that we are planning to expand and broaden substantially research in the spheres of engineering psychology, ergonomics and the influence of the personality factor. It is necessary here to concentrate the efforts of specialists and a stable laboratory base. We will therefore support the proposed scientific cooperation with other scientific organizations, including those of related industries of the economy.

[Gorlov] We are also planning to expand this research at GosNII.

[Fedorov] Much attention is devoted to improving on-board equipment. Equipping the trunk-line fleet with automatic on-board control systems for calling at ICAO category-II runways will greatly increase flight regularity and safety and will produce an appreciable economic saving. That is why it is necessary to develop this area of scientific work more actively.

Much needs to be done on the incorporation of the planned new vertical-stacking system, equipment for optimal route choice and flight mode optimization, and the use of more modern methods of planning air traffic.

[Editors] And what is being done to increase the efficiency of the utilization of operating aircraft equipment and, especially, equipment with high fuel efficiency?

[Kasyanchik] The industry has at its disposal every opportunity to fulfill the amount of work planned for the five-year plan and to increase substantially the efficiency of production. What is necessary for this? The further concentration of the aircraft fleet and improvement of its utilization have great significance. The number of flight hours achieved by the principal types of aircraft--the Il-62, the Tu-154 and the Il-76--cannot be deemed satisfactory. The Il-86 aircraft can be utilized much more efficiently. One reason it lags is shortcomings in aircraft deployment to basing locations and air routes and the unsatisfactory development of the air-traffic schedule--without taking into account airport capabilities and equipping. All of this has the effect that our assets are not "working" at full strength.

The development of airfields requires particular attention, along with the development of fundamentally new methods of aircraft operation and maintenance. We have supported a reduction in manual labor for many long years, but its proportion at aviation enterprises is still too great. Equipment is delivered to civil aviation without being fully outfitted with the necessary mechanization equipment. For this reason, for example, it is impossible to incorporate a container system and mechanized loading and unloading operations on the Tu-154, which executes almost half of the total amount of air shipments.

Work on conserving material resources acquires inestimable significance under modern conditions. The further development of the industry is placed in direct dependence on increasing the efficiency of aviation fuels and lubricants.

[Nikitin] One of the most important factors in raising the efficiency of the civil aviation aircraft and helicopter fleet is its good condition. This is a very important reserve that is not always utilized to the fullest. This relates especially to the Krasnoyarsk, Kazakh, Uzbek, Ukrainian and Far East administrations.

Intensified rates of development of the local productive base will be necessary to raise the efficiency and quality of aircraft equipment maintenance. Success in this matter depends greatly upon utilizing the achievements of science and technology. Then, by way of example, it is possible to accommodate the demands of the present day and modernize hangars that have already existed for more than one decade, as was done in the Leningrad Administration.

The engineering service can and should make a substantial contribution to increasing the fuel efficiency of aircraft and in raising the efficiency of their maintenance processes on the ground. Thus, the incorporation of the recommendations of scientists on flushing the gas-air duct of the NK-8-2U engine, as shown in an experiment, makes possible up to a one-and-a-half percent fuel saving in flight, and the application of a new YaK-42 test methodology on the whole fleet of that type aircraft makes it possible to save up to 200 tons. It is necessary to strive for the utmost incorporation of these progressive methods.

[Nosenko] The need of the aircraft repair industry to incorporate the achievements of scientific and technical progress is dictated by the repair facility itself (the newest successes of science, equipment and technology are concentrated in its design), as well as the necessity of attaining the assigned technical and economic production indicators with the lowest possible labor and material expenditures. The possibilities here are the broadest. Take the technological processes of renovating worn-out aircraft equipment parts and assemblies with their simultaneous reinforcement. Detonation and plasma spraying are utilized at the plants along with electric-arc and laser welding, vibration tumbling, galvinization processes, electroerosion etc.

In the new five-year plan, it is planned to broaden considerably the amount and range of parts renovation so as to reduce requests for new spare parts by a total of 70 million rubles. But for this it is necessary to obtain renovation equipment from the developers and suppliers of aviation technology, equip plants with the necessary tooling and conduct research and safe-life testing of the renovated parts and assemblies.

Great benefits are promised in aviation repair by the incorporation of new, progressive materials and the technology of their application. It is well known, for example, that painting aircraft with polyurethane enamel permits a saving of up to two percent in jet fuel. This is a very appreciable saving! A test painting was conducted of Tu-154, Tu-134 and YaK-40 aircraft in

conjunction with GosNII. Operations confirmed the good operating characteristics. But issues in the mass application of the technology are still not resolved. To accelerate it, it seems expedient to create temporarily an inter-departmental scientific and technical subunit that would be charged with resolving the whole set of questions. At the same time, it is necessary to begin the series production of polyurethane enamel in the required quantities.

Automatic technological-process control systems are used in aircraft-repair production. This relates in the first place to aircraft engines. Such systems are already operating successfully at several plants. They must be more boldly and energetically incorporated into production.

Scientific and technical progress should become the basis for increasing labor productivity. The mechanization of production processes in repair sections with difficult and unhealthy working conditions, the application of flow lines and dispatching using microcomputers are important in this. The rate of work in these areas still needs to be increased.

The creation of more progressive repair systems acquires particular significance with the entry of new-generation aircraft into service. In the next year or two, diagnostic complexes must be created that are equipped with modern technical diagnostic and continuous monitoring equipment and new defect-detection technology.

A few words about raising the technical level of the mechanization equipment for principal airport technological operations that is produced by industry test plants. The state of affairs in this area has lately been the subject of justified criticism. We feel that the organization of specialized industry design bureaus at three test plants, along with the expansion of test sections and the creation of laboratories and test ranges, will make possible a turn for the better.

And finally, increasing the efficiency of incorporating innovations should be assisted by improving the management mechanism. Economics should provide the impetus for incorporation. It is still oriented toward "gross output" and volumetric indicators.

[Editors] As soon as the discussion touches on raising labor productivity and the automation and mechanization of technological processes, it is worthwhile to give the floor to the representative of the leading organization that is occupied with designing technical ground equipment--the Aeroproyekt GPIiNII.

[Chernikov] Fundamentally new technical solutions aimed at improving passenger service, mechanizing and automating production processes and reducing manual labor will be developed and incorporated with our participation in the 12th Five-Year Plan.

In the area of passenger service, new information systems and electronic baggage weighing will be created using microcomputers.

The creation of small-sized tractors, container carts and mechanisms for handling and transporting large-sized containers are planned for cargo handling. The development of a large-aircraft tow tractor, installations for the mechanized washing of the external surfaces of aircraft and other equipment serve the purpose of further equipping airports with mechanization equipment.

Considerable attention will be devoted to increasing the reliability of the equipment produced, improving the conditions of its operation and repair, unification and universality and the transition to cheaper types of fuel. Work will also be conducted on certification and the further improvement of airport production processes.

The utilization of all of these developments will make possible up to a 62-percent increase in the level of airport mechanization by 1990.

[Pashchenko] In engineering practice, there is still no unified methodology for eliminating failures and defects. In this regard, organizing the elimination of defects should be assigned particularly important significance as the most important reserve for increasing flight regularity.

Work has been conducted in recent years at TsUMVS on improving the technical operating processes of aircraft. The "Poisk" [search] information-management system for the operational elimination of failures in flight and in technical maintenance has been created. Scientists of the industry and specialists of the aviation industry are taking part in this work. The contribution of science today, however, is clearly inadequate for the broader incorporation of the "Poisk" system. And it is very difficult for the production workers themselves to handle this task.

[Editors] We have reached one of the pivotal issues in accelerating the incorporation of scientific and technical achievements--the link between science and production. What problems have to be solved in this area?

[Chernikov] One possible organizational form for linking science and production is temporary scientific and technical collectives in which a whole range of work is concentrated--from research to the production of new equipment, including the implementation of developments and the creation of prototypes and production processes. It would be expedient for us to use this form as well, it seems, to resolve issues in the mechanization of production processes with the creation of a temporary collective based on the scientific subunits of the Aeroproyekt GPIiNII, GosNII, the Riga Division of GosNII, its experimental base and test plant No 85.

[Nosenko] Sometimes the causes of our failures are the fact that we ignore economic incentive in the incorporation of innovations. To blaze a trail to the new with administrative measures alone is difficult, if it is possible at all. It is necessary that the economic mechanism itself "vote" for progress and for the attainment of a higher end result. The situation is still otherwise. Here are some examples. The system of efficiency indicators for aircraft repair production by volume of work (in fact, the very same notorious "gross output") does not provide an incentive for the transition to a

progressive method of repair according to technical condition. It turns out that it is more advantageous for the plant to repair articles that are in good condition! And still more. The issue of fuel economy stands before us with all of its urgency. And I can cite instances where equipment was deliberately set at higher expenditure levels at the plant: it is simpler that way and nobody questions the overexpenditure very harshly. It is necessary that working in the old way, without a glance to the future, is made simply unprofitable--both for the employee and the enterprise. The Organization of Labor and Wages Administration of our ministry should, I believe, have its own say. It is still not involved.

[Fedorov] We have a similar problem as well. ATC equipment does not generate a direct profit, and therefore the fixed assets do not "work" to full effect. The incorporation of the new still depends basically on an understanding of the importance of the task on the part of managers and on their enthusiasm (as is the case, let's say, in the Leningrad and North Caucasus administrations). Effective economic controls are necessary.

[Editors] And what role can the science of higher educational institutions play in increasing the efficiency of scientific inquiry?

[Parkhimovich] Modern-day requirements dictate the necessity of a profound restructuring of higher and secondary special schools, an increase in the qualifications of their personnel and the improvement of scientific research. The higher educational institutions of civil aviation today possess considerable scientific potential, and scientists are carrying out much useful work. At the same time, the amount of research at higher educational institutions could be increased by two to two and a half times and its efficiency considerably increased. What hinders this?

It is, first and foremost, the unsatisfactory organization of scientific planning in the institutions and the poor management of scientific work. In such a situation, petty research and "dissertationism" flourish instead of the specific resolution of practical industry problems. Another shortcoming is the lack of coordination between major scientists and parallelism in their work. The solution is the development and formulation of integrated programs with the enlistment of the scientists of the educational institutions.

[Verkhovin] That is already being done. Integrated scientific and technical programs on priority issues of industry development which envisage the participation of the higher educational institutions have been developed and approved.

[Parkhimovich] There is not an adequate experimental base for broad scientific research in the higher institutions. Appropriations for its development are practically not allotted. It is enough to say that the airfield complex at the Kiev Institute has been under construction for ten years. Therefore, certain unique instruments and equipment that have been created by the scientists remain single copies. The problem can be resolved by creating major joint experimental bases for educational institutions according to a definite structure, as well as the series production of both

scientific equipment and the developments of educational institutions at industry plants.

Shortcomings in the mechanism for incorporating the achievements of the scientific thought of the institutions into practice have not been surmounted. Production has no indicators (and sometimes no funds) that would create an interest in their incorporation. Scientists are paid only for research labor and there are no incentives for incorporation. Therefore it is more advantageous to be a theoretician and not be concerned with practice. An integrated system of economic incentives is necessary that would link everyone with a vested interest "through" to the end result.

[Kasyanchik] That issue is being studied. We should have developed a system of indicators in the first half of this year that takes into account the incorporation of new equipment and technology, the results of scientific developments and innovative proposals in collective work practice. These will be included as basic indicators in administration, plant and airport plans.

[Parkhimovich] The link between scientific educational institutions and production is still inadequate. It has been noted frequently that scientists sometimes poorly understand the problems facing civil aviation. That is how that defective output is allowed in science. Thus, it is justified to note the incompetence of the scientists in the Academy of Civil Aviation that are occupied with sociological research. Life demands that we proceed along the path of creating branches of departments and scientific laboratories in production, as well as educational-scientific-production associations.

[Verkhovin] It is time to sum up the results of the discussion. To my mind, the conversation was specific and business-like. I think that it will have definite usefulness in the cause of accelerating scientific and technical progress in the industry and will aid the increase in the efficiency of our work. I am confident, however, that the topic of discussion is far from exhausted. We expect that the labor collectives and specialists of Aeroflot and the readers of our journal will participate in it. Revealing yet unutilized reserves in accelerating scientific and technical progress and bringing them into effect by joint efforts, we will fulfill the tasks before the industry in a successful and high-quality manner.



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CIVIL AVIATION

## COLLEGIUM METES OUT PUNISHMENT IN NEWSPAPER CRITICISM SCANDAL

Moscow VOZDUSHNYY TRANSPORT in Russian 11 Mar 86 p 3

[Report on proceedings of the Ministry of Civil Aviation Collegium and the presidium of the Aviation Workers Trade Union Central Committee]

[Text] As our newspaper has already reported, a joint meeting of the collegium of the MGA [Ministry of Civil Aviation] and the presidium of the Aviation Workers Trade Union Central Committee examined the question of work by supervisory personnel and public organizations of civil aviation to carry out the directions of the April (1985) Plenum of the CPSU Central Committee on the development of criticism and measures to improve the effectiveness of critical statements in the press in light of the requirements of the CPSU Central Committee decree "On the cases of crude bureaucracy and suppression of criticism in regard to the editorial staffs of the newspapers VOZDUSHNYY TRANSPORT and VODNYY TRANSPORT."

Implementation of the party's policy on accelerating the country's socioeconomic development, initiated by the April (1985) Plenum of the CPSU Central Committee, demanded of supervisory personnel and party and public organizations of civil aviation a rapid rebuilding, development of new approaches to resolve the tasks that have been set, improvement in the style and methods of work, and development of criticism and self-criticism.

However, as noted at the meeting of the Ministry of Civil Aviation Collegium and the presidium of the Aviation Workers Trade Union Central Committee, part of the management personnel of the ministry (Yu. I. Baranov, Yu. P. Darymov, N. V. Momot) and of the administrations of civil aviation (V. N. Glushkov, A. M. Goryashko, G. P. Laskin) still have not become fully aware of the time requirements, are reorganizing extraordinarily slowly, and do not always react to criticism in the proper manner.

Deputy ministers B. Ye. Panyukov, I. F. Vasin, I. Ye. Mashkivskiy, and O. M. Smirnov; former collegium members N. A. Bulanov and L. S. Svechnikov; and I. V. Kabakov, secretary of the Aviation Workers Trade Union Central Committee, have not shown the proper exactingness toward supervisory personnel of the Ministry of Civil Aviation and aviation enterprises for the cases of crude bureaucracy and suppression of criticism with regard to the newspaper VOZDUSHNYY TRANSPORT.

Managers of the Ministry of Civil Aviation and the Aviation Workers Trade Union Central Committee and public organizations seldom make statements in the newspaper and journal, do not always take the problems raised in the sectorial press into consideration in their practical work, and resolve them slowly.

On the part of certain managers of civil aviation administrations (V. A. Kolosov, A. A. Konnov, B. T. Turik and others), cases of indifference toward the requests and needs of the newspaper VOZDUSHNYY TRANSPORT'S own correspondents are being tolerated.

The "Vozdushnyy Transport" Central Newspaper and Journal Publishing House is not providing the necessary measures of material and technical support for issuing the newspaper and journal. Since its inception, VOZDUSHNYY TRANSPORT has been published at a printing base which is not in a position to ensure that is issued according to plan with quality.

At the same time, the collectives of editorial staffs are still not making full use of the power of the printed word to educate and mobilize labor collectives to intensify production and to increase the productivity, efficiency and quality of work in every possible way.

The Ministry of Civil Aviation Collegium and the presidium of the Aviation Workers Trade Union Central Committee have approved a decree in accordance with which deputy ministers and chiefs of the ministry's administrations; secretaries and division heads of the Aviation Workers Trade Union Central Committee; chiefs of administrations, associations, enterprises and organizations of civil aviation; and chairmen of republic, territorial, association and trade union committees are obligated to take steps to fully implement the requirements of the CPSU Central Committee decree "On cases of crude bureaucracy and suppression of criticism with regard to the editorial staffs of the newspapers VOZDUSHNYY TRANSPORT and VODNYY TRANSPORT." They were ordered to concentrate collectives' efforts on developing criticism and self-criticism and revealing shortcomings, production reserves, and ways of improving ideological and educational work. To react promptly and in a businesslike manner to critical material published in the press and to eliminate instances of disregard for criticism.

To conduct a thorough critique and promptly undertake effective and practical steps with regard to all critical materials in the press on the work of subordinate aviation enterprises, institutions and organizations. To strictly penalize those officials who are to blame for tolerating shortcomings and neglect in work and red tape and bureaucratism in investigating critical facts published in the press. To report in a timely manner on steps taken in the press organs.

At the same time, the task has been set of stimulating work to carry out the plan and socialist pledges for 1986; to ensure the safety and regularity of flights; to provide for personnel selection, placement and training; and to reinforce labor discipline in conformity with time requirements, taking into account the governing documents of the Ministry of Civil Aviation and the

Aviation Workers Trade Union Central Committee and critical statements in the press, having directed the efforts of aviation worker collectives to thorough study of the decisions of the 27th CPSU Congress and putting them into practice. Particular attention was devoted to increasing the prestige of the sectorial press in every possible way, to open and truthful discussion of pressing problems, and to putting affairs in order everywhere in accordance with the party's requirements. Command personnel and representatives of trade union committees have been ordered to make personal trips to aviation enterprises together with representatives of the sectorial press in accordance with critical signals and letters from localities, to take part regularly in commenting on editorial mail and in preparing responses and explanations to aviation workers' questions, and to direct materials to editorial staffs for interpretation in the press of the problems of improving work style and methods in light of the party's current requirements.

The decree stipulates that the work of the ministry collegium and the presidium of the trade union central committee include the practice of hearing the accounts by chiefs of the ministry's administrations, the supervisors of administrations and aviation enterprises, and chairmen of trade union committees on measures being taken to resolve the most urgent problems raised in the sectorial press.

Chiefs of administrations and chairmen of republic and territorial committees of the trade union have been charged with examining, at joint meetings of administration councils and the presidiums of territorial committees, the status of work with regard to critical statements in the press and informing editorial staffs in a timely manner, and with taking steps against officials who disregard criticism in the press without drawing the appropriate conclusions from it. They also have been called upon to contribute to the work of editorial staffs of the sectorial press and correspondents of the VOZDUSHNYY TRANSPORT newspaper in every way possible, to establish fitting conditions for them, and to further involve the managers of aviation enterprises and public organizations and outstanding production workers in collaboration in the press.

The chief of the Ukrainian Administration and rectors of the KIIGA and RIIGA [Kiev Order of Labor Red Banner Institute of Civil Aviation Engineers and Riga Order of the Red Banner Institute of Civil Aviation Engineers imeni Leninskiy Komsomol] are to take steps to increase the effectiveness of large-circulation newspapers in light of the CPSU Central Committee decree.

The director of the "Vozdushnyy Transport" TsGZhI [Central Newspaper and Journal Publishing House] has been given instructions to draft up to 15 March 1986 and present for approval a specific plan of measures to improve production and economic activity and material and technical support of the work of editorial staffs and for publishing the newspaper and the journal.

The chief editors of the newspaper VOZDUSHNYY TRANSPORT and the journal GRAZHDANSKAYA AVIATSIYA have been ordered to take steps for more complete coverage of the problems of aviation workers' communist education and the activity of civil aviation labor collectives to fulfill plan targets and socialist pledges and for widespread propaganda of advanced experience, to

expose shortcomings and analyze their causes, and to bring about increased effectiveness in published materials. To implement measures to improve the selection and placement of personnel; to improve journalists' political, economic and vocational training; to increase their skill; to develop initiative; and to instil a spirit of self-criticism and responsibility for work assigned.

The collegium of the Ministry of Civil Aviation and the presidium of the trade union central committee have decreed: for shortcomings in work with editorial staffs of the newspaper and the journal and for failure to take the proper steps to increase the effectiveness of the sectorial press, N. A. Bulanov, director of the "Vozdushnyy Transport" Central Newspaper and Journal Publishing House (formerly ch'ef of the UPVR MGA [Political Indoctrination Work Administration of the Ministry of Civil Aviation]) is severely reprimanded.

For poor work in eliminating shortcomings noted in the press, for an attitude of indifference toward the needs and legal requests of staff correspondents of the newspaper VOZDUSHNYY TRANSPORT, and for failure to carry out the orders and instructions of the Ministry of Civil Aviation concerning the equipment of korpunkty [correspondents centers], chiefs of civil aviation administrations V. N. Glushkov, V. A. Kolosov, A. A. Konnov, G. P. Laskin, V. A. Nacharov, V. V. Tkachenko, B. T. Turik and A. T. Khalin and chairmen of republic and territorial committees of the Aviation Workers Trade Union E. P. Aksenov, O. N. Anishchik, V. A. Visitskiy, I. P. Vikhrev, G. I. Dolgalev, I. D. Zvinnik, A. I. Kurkin and B. U. Salimov are severely reprimanded.

The unsatisfactory work to eliminate shortcomings exposed by the press, the incorrect reaction to criticism, and the lack of businesslike interaction with the editorial staffs of the sectorial press are pointed out to deputy ministers B. Ye. Panyukov, I. F. Vasin, I. Ye. Mashkivskiy and O. M. Smirnov; I. V. Kabakov, secretary of the Aviation Workers Trade Union Central Committee; ministry administration chiefs Yu. I. Baranov, Yu. P. Darymov, N. V. Momot and T. N. Temkina; and R. G. Glushkov, chairman of the Ministry of Civil Aviation profkom [Trade Union Committee].

First Deputy Minister of Civil Aviation B. Ye. Panyukov; V. S. Kolchanov, member of the Ministry of Civil Aviation Collegium; and I. V. Kabakov, secretary of the Aviation Workers Trade Union Central Committee, are charged with verifying implementation of this decree.

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CIVIL AVIATION

# GENERAL DESIGNER BALABUYEV ON An-124 RUSLAN FEATURES

Moscow TEKHNIKA - MOLODEZHI in Russian No 2, Feb 86 pp 30-35

[Interview with Petr Vasilyevich Balabuyev, general designer, and Viktor Ilich Tolmachev, deputy chief designer, of the OKB [Experimental Design Bureau] imeni O. K. Antonov by TEKHNIKA--MOLODEZHI correspondent Pavel Kolesnikov: "The Robust Tradition of 'Ruslan'"; time and place not specified]

[Excerpts] The appearance of the An-22 ("Antey") winged heavyweight, capable of carrying 80 tons of different cargo, became a sensation 20 years ago. Created on the same drawing board as the "Antey," the "Ruslan" has a cargo capacity which is almost double that of its "older brother." It has already scored 21 world records, including carrying a load of 171.2 tons to an altitude of 10,700 meters!

The magazine's correspondent, Pavel Kolesnikov, asked Petr Vasilyevich Balabuyev, general designer of the OKB imeni O. K. Antonov, Hero of Socialist Labor and winner of the USSR State Prize, and Viktor Ilich Tolmachev, deputy chief designer, to tell about the new aircraft.

[Correspondent] How does the new aircraft differ, and what are its basic features?

[Balabuyev] I point out first of all that developing an aircraft of large cargo capacity is not an end in itself. For example, the "Antey" turned out to be indispensable for transporting cargoes with large dimensions to regions far from the customary routes. It carried drilling equipment and building materials over the taiga and the marshes for the new construction projects of Tyumen and machinery of every description and finished bridge trusses for the BAM [Baykal-Amur Mainline], and it delivered advanced detachments of construction workers together with their quarters and machinery to locations of future settlements and cities. The An-22 is operating successfully now as well.

The new aircraft--the An-124--is distinguished not only by its larger cargo capacity and the substantial dimensions of its cargo cabin. The labor productivity of the "Ruslan" is three times higher. Transport workers know that the larger the cargo-carrying capacity per unit of a means of transport, the higher its economy. The efficiency indicator of the An-124, that is, the ratio of the work performed to the cost of the aircraft's life cycle (expenditures for designing, construction and maintenance of a fleet of aircraft until it is written off for scrap) is three times higher than aircraft of the preceding generation.

[Correspondent] But could an aircraft possessing such advantages have been built then, 20 years ago?

[Balabuyev] No, and this is why. When linear dimensions of an object are increased on a given scale, the so-called square-and-cube law applies. The point of it is that, if the area of a cross section is squared, the volume, and consequently the mass, is cubed. If, for example, all measurements of the main structural beam of the wing--the spar--are doubled, the area of a cross section of it will become four times larger and the volume will be eight times larger. The volume multiplied by the density of the metal is the mass--that is the weight, figure it out--and the spar was increased in weight eight times as much; the area of the cross section--that is the strength, and it follows that it has become only twice as strong! So it is impossible to increase the measurements of an aircraft infinitely. Otherwise, it will turn out to be a giant weighing about 800 tons. Such a cumbersome thing needs even more powerful, and hence heavier, engines, and so on... One problem involves another one right away. As a result, it is unlikely that this "monster" could get off the ground.

But it is well known that design efficiency depends not only on measurements, but on the overall level of knowledge in the broadest sense of this word. Over the past 20 years, our science, engineering and technology have made great progress. Guided by the achievements of Soviet scientists and engineers working in all sectors of the national economy who are developing this very knowledge on a qualitatively higher level, we have been able to build an aircraft of a new generation, an aircraft of the 21st century, I would say. After all, each aircraft is developed for the long term, 15 to 20 years ahead, and not only the latest innovations in engineering, technology and materials are incorporated in it, but also what is approaching, so to speak. In this sense, each aircraft is a unique generator of scientific and technical achievements.

The new aircraft was developed in a new way. As never before, computer technology was utilized extensively in designing the "Ruslan." Certain components were not only calculated, but drafted, by machine. And wind-tunnel models were created without drawings at all: the computer transmitted the results of its calculations directly to the machine tools with ChPU [numerical control].

The aircraft's aerodynamic properties and the optimal solution for the different on-board systems were worked out with the aid of a simulator. Use of the computer made it possible to reconstruct real flight conditions on it for the crew, not only from the viewpoint of the aircraft's stability and controllability, but even by simulating the air condition and the sound of the engines operating in various regimes.

[Correspondent] Please tell us in more detail--what is fundamentally new in the An-124 aircraft?

[Balabuyev] I think it is time to pass the word to Viktor Ilich Tolmachev, especially as he is the one in our design bureau who has been charged with guiding the An-124. Moreover, Viktor Ilich was a unique "guide" of the An-124 at the Le Bourget exhibition and has accumulated certain experience in dealing with the press.

[Tolmachev] Work on such a giant scale caught all sections of our design bureau in its orbit. As Petr Vasilyevich has already mentioned, extensive use of the latest achievements of science and technology not only in the design being created but in the work's organization itself significantly increased the level of project planning and production. Completely new industrial processes are being introduced for series production of the An-124. In particular, machining of large-sized components on machine tools with numerical control, shaping by the blast method [metodom vzryva], and so forth. I can say that we have overtaken the world's most advanced aircraft manufacturing firms today in the technology of producing composites and making panels of very large dimensions.

They say that the world is supported on three whales. An aircraft is supported on four. First, there is the level of aerodynamic perfection; secondly, the load ratio; thirdly, the engine economy; and finally, the technological effectiveness in operation. A high level of reliability is implied at the same time, naturally.

The sweptback supercritical wing on the An-124 is an innovation from the viewpoint of aerodynamics. Usually we are compelled to make sweptback wings thin. Use of the supercritical profile provided the opportunity to make it thick, with substantial construction depth, but the wing's aerodynamic drag was not increased. Owing to this, the design turns out more easily and technologically efficient in the manufacture than the thin one, other things being equal. The interior space that was formed has made it possible to accommodate a substantial fuel supply, since the wing root is as thick as 2 meters, as an example. This is the first time in the world that a supercritical wing has been used on an aircraft of this class.

In improving the aerodynamic characteristics of the "Ruslan," electronic engineering specialists helped very much, as strange as this may seem. They worked a great deal to ensure that as few protruding antennas and other "outgrowths" as possible were on the fuselage. Everyone who is involved in one way or another with radio communications knows how complex modern antenna systems are. Others can take my word for it that the antennas flush-mounted on the fuselage of the An-124 are the latest word in electronics engineering.

A definite gain was achieved by improving localized aerodynamics: openings in the joints of panels, doors and hatches have been eliminated. This has made it possible to rule out the overflow of air currents inside the airframe. The shapes of fuselage couplings with the wing and the empennage were selected with great care.

[Correspondent] In addition to all the combined measures aimed at simplifying design, there probably was a struggle over the weight of each assembly, unit and device?

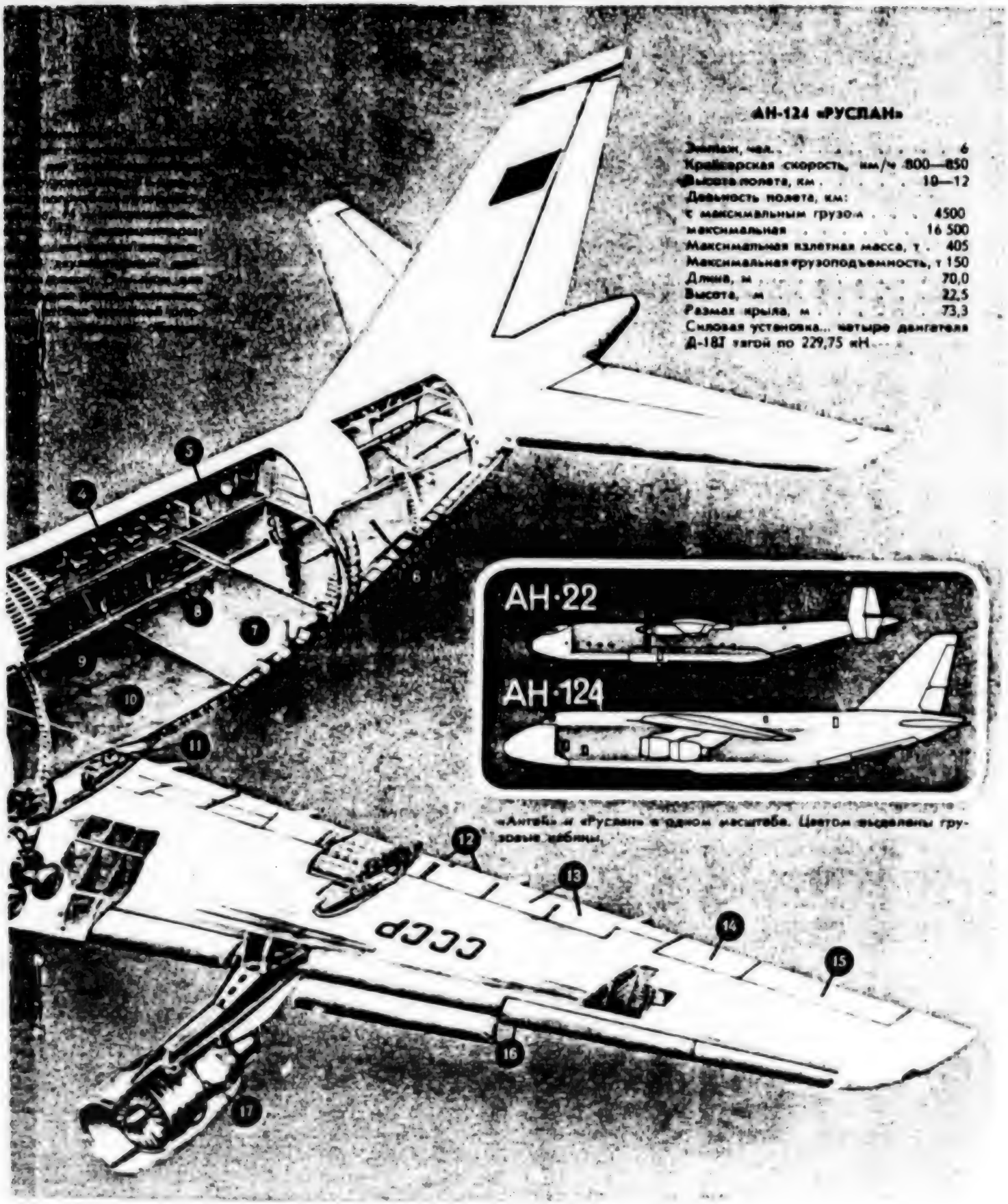
[Tolmachev] That is exactly the way it is. One of our important tactical procedures was to use composition materials: fiberglass and carbon-based plastics [ugleplastiki]. These materials have not yet become traditional, let us say, in aircraft manufacturing, and the range of their application is usually small. With the aid of composites, we have succeeded in reducing the weight of many load-bearing elements and units by 30 percent. True, this has required that fundamentally new technology be developed and introduced.

Many of the systems and assemblies in the "Ruslan" are similar to those in other aircraft, but design solutions were reached differently, on a new level. For example, the "Antey" also had an automatic landing gear braking control system. But a centrifugal regulator was used there, and control is electronic on the "Ruslan." There are many such examples that could be cited. As a result of all these innovations, the weight efficiency of the "Ruslan" has been increased substantially compared with aircraft of the previous generation.

[Correspondent] For a long time all the aircraft of your experimental design bureau, including the "Antey," have been equipped only with turboprop engines. It is well-known that they are more economical in the current stage of gas turbine engine development. What prompted the switch to a new type of powerplant?

[Tolmachev] The turboprop engines of the "Antey" are unsurpassed even now in their class in all indicators, but even their output turned out to be insufficient for the An-124. Ducted-fan, or as they now say in some cases, turbofan engines now occupy an intermediate position between turbojets and turboprops. They are much more economical than the former and develop substantially more thrust than the latter. The D-18T, developed under the leadership of general designer V. A. Lotarev especially for the "Ruslan," is just such a turbofan engine. This engine is simply a marvel of technology! There are none more powerful in the world now--the thrust of one is nearly 230 kilonewtons, or 23.4 tons, to state it in the old way. The powerplant of the "Ruslan" has proved to be extremely quiet; it corresponds to the strict requirements of the International Civil Aviation Organization (ICAO) for the level of noise generated. The D-18T pod is made mainly of nonmetals, which has provided not only weight economy, but also has made it possible to resolve the problems of durability and acoustic stability.

# АН-124 „Руслан"




«Антей» и «Руслан» в одном масштабе. Цветом выделены грузовые кабины

Key to cutaway drawing of An-124 on preceding pages

(1) Circled numbers (listed upper left):

1. Basic crew's cabin
2. Alternate crew's cabin
3. Crew sleeping quarters
4. Cabin for those accompanying cargo
5. Upper deck
6. Rear cargo hatch
7. Ramp for rear cargo hatch
8. On-board loading equipment
9. Monorail
10. Cargo cabin
11. Auxiliary powerplant
12. Flaps
13. Spoilers
14. Inboard aileron
15. Outboard aileron
16. Slats
17. D-18 turbofan engine
18. Main landing gear struts
19. Emergency escape hatch
20. Entry door, ladder
21. Auxiliary strut
22. Left nose-wheel strut
23. Forward cargo hatch
24. Nose cone

(2) An-124 specifications (listed upper right):

| | |
|---|---|
| Crew | 6 |
| Cruising speed | 800-850 kilometers per hour |
| Ceiling | 10-12 kilometers |
| Full-load range | 4,500 kilometers |
| Maximum range | 16,500 kilometers |
| Maximum takeoff mass | 405 tons |
| Maximum cargo capacity | 150 tons |
| Length | 70.0 meters |
| Height | 22.5 meters |
| Wingspan | 73.3 meters |
| Powerplants | 4 D-18T engines, each with thrust of 229.75 kilonewtons |

(3) Caption under boxed drawing of An-22 and AN-124:

The "Antey" and the "Ruslan" on the same scale. Cargo cabins are shaded.

[Correspondent] Evidently the creators of the "Ruslan" have devoted particular attention to ensuring that as little special ground-based equipment as possible is needed in order to maintain it as simply as possible?

[Tolmachev] Computerization of the An-124, unprecedented in its scale, is again helping to ensure the aircraft's simplicity in operation on the ground and in the air. It has 34 computers on board! They were brought together in four main systems: navigation, the autopilot system, distance control and monitoring.

The on-board computers also have been charged with checking the readiness of the aircraft's systems for flight. They monitor their status in flight, analyze the operating efficiency of assemblies and units, track parameters, signal failures and malfunctions, and provide the crew with recommendations for adjusting flight regimes.

[Correspondent] How is the problem of the safety of such a complex aircraft as the An-124 resolved practically, and what is more, under conditions when all the vitally important systems depend on computers? Sometimes you can't avoid trouble with one of them, but the "Ruslan" has 34 on board!

[Tolmachev] There is always a risk, you know. Even when we cross the street.

High reliability is ensured by quadruple redundancy, and the shift to a backup system takes place automatically. The structure of the on-board computer system is based on this. Decentralization of the computers being used in the "Ruslan" systems makes it possible when there is a malfunction in one of them to increase the load of another one.

[Correspondent] The high degree of computerization of the aircraft and automation of all the systems has evidently led to a "man-machine" relationship on a different level of quality. How has this affected the requirements for the crew's professional preparedness?

[Tolmachev] A considerable part of the "Ruslan" flight crew's work involves the work of computer operators. An aircraft of the new generation imposes fundamentally different demands on the crew's level of skill. The level of knowledge and intellect must correspond to each level of technology that is qualitatively new.

Usually two crews work on the "Ruslan." The one not on shift can rest in a specially equipped cabin resembling a multiroom apartment with all the conveniences.

Loading and unloading are processes of no less importance for a transport aircraft. In this respect, the layout and equipment of the "Ruslan" are rather traditional. But the An-124 can also, as if "squatting," shorten the length of the landing gear struts so that the floor of the cargo cabin is as close as possible to the ground. Driving into the cargo cabin is even easier than up a hill of average dimensions. The "Ruslan" is equipped with two 10-ton cranes and other machinery. There is an 88-seat cabin on the "Ruslan" for persons accompanying the cargo that is no less comfortable than on passenger airliners.



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CIVIL AVIATION

## AUTOMATED FLIGHT TEST DATA EVALUATION SYSTEMS DEVELOPMENT

Moscow VOZDUSHNYY TRANSPORT in Russian 4 Mar 86 p 4

[Article by M. Lopatinskiy, chief of a division of the GosNII GA [State Scientific Research Institute of Civil Aviation] under the rubric "Successes and Problems in the Data Processing Industry": "The Problems Are Not Only Technical"]

[Text] The paper--or rather, a small piece of it--looks ordinary. Such "pieces" are glued on the wing spars, load-bearing elements of the landing gear and other parts of an airliner that are most "susceptible" to loads. The "paper" is none other than a tensometer. It is rather simple in structure: a very fine wire glued with a special paper on both sides. During a flight, the wire is distorted together with the structure of a specific part of the aircraft. Its resistance is altered, and an electric signal generated in the process is recorded on a special recording device. Later, on the ground, a magnetic tape is processed in a special computer complex.

This is the way that scientists of the State Scientific Research Institute of Civil Aviation find out the extent of fatigue damage to an aircraft and the potentialities of structures, how many times an aircraft can land on an unpaved surface, let us say. Special data recording systems (IRS), which provide measurements, monitoring and magnetic recording of experimental data, and specialized computer complexes (SVK), designed to reproduce and process data according to the algorithms assigned--all these are components of one overall system, an automated system for processing the results of flight tests.

Today one of the scientists from the sector's main institute shares his opinion on the problems of operating and developing this system in our newspaper.

Flight tests... Of all the forms of experimental research, they help the most to determine the complex principles of an aircraft's interaction with the external environment and with the person who flies it. For this reason, they provide invaluable information, which is utilized both in the stage of developing and finishing new structures for aircraft as well as in the stage of their wide use. Our automated system has the most diverse tasks: research on the loading of structures already mentioned, evaluation of aircraft performance and the operating parameters of powerplants, research on the physical properties of the metal in aircraft components, and creation of a data bank for solving the problems of identifying the parameters of models.

Clearly, the requirements for automated processing are continuously increasing. A task of providing for a controllable flight experiment is advanced. Approximate analysis of data in the process of carrying out the flight is expected. Higher productivity of systems, processing during the conduct of tests outside the main base, and a number of other things are needed. All this requires specific technical and mathematical re-equipment. For this reason, a system is now being developed at the State Scientific Research Institute of Civil Aviation based on a new-generation computer. A number of other promising studies are being conducted jointly with the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences and enterprises of the Ministry of the Aviation Industry.

Additional difficulties also arise when an automated process is improved. I mean the various kinds of similar systems for processing materials from flight tests. The majority of them are similar in technical composition. Nevertheless, because of the particular traditions of each enterprise, they are different systems which are distinguished by the structure of software and other characteristics, despite the fact that they were all designed to solve identical problems. Developing and improving each of these individually requires much labor-intensiveness and is extremely uneconomical. At the same time, staff members of the sector's main institute who conduct joint flight tests with the employees of many enterprises in industry are experiencing particular difficulty, since they are compelled to ensure the technical and program compatibility of their system with each one.

The situation is even more complicated with the updating of data recording systems. Creation of a modern data recording system for flight testing is within the capability of only a well-equipped specialized enterprise. The aircraft industry has such enterprises at its disposal. In accordance with its functions, civil aviation cannot and should not have them. For this reason, the sector's main institute, which provides a broad range of flight testing, obtains data recording systems from the Minstry of the Aviation Industry. However, how does this take place? Enterprises of the MAP [Ministry of the Aviation Industry] acquire the new equipment first, and we receive it only when they are fully "satiated." And when our turn comes, it is out of date.

Can this situation be changed? There is a way out. A plan for material and technical support is stipulated for the development of each new type of aircraft in industry. It is necessary to provide in this plan for the interests of the State Scientific Research Institute of Civil Aviation as an enterprise which also provides an important stage in an aircraft's development.

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CIVIL AVIATION

## CHIEF ON DEVELOPING SIRENA-2 AUTOMATED TICKETING SYSTEM

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 2, Feb 86 p 26

[Interview with Ministry of Civil Aviation [MGA] Central Passenger Ticketing Agency Chief V. I. Zhebrak by I. Goldin under the "From Congress to Congress" rubric: "Using Computers"; time and place not specified]

[Text] Sirena, the first automated air-ticket sale and seating reservation system in civil aviation, operated from 1972 to 1982. Over the course of its operation it served more than 98 million passengers. The nationwide automated Sirena-2 system was created in Moscow in 1981 and was the successor to the most important scientific and technical solutions generated in the course of Sirena operation. What caused the necessity of substituting the improved version for the first automated system, and the possibilities that the Sirena-2 opens up for improving passenger service and the working conditions of aviation employees, are related by Ministry of Civil Aviation's Central Passenger Ticketing Chief V. I. Zhebrak.

[Question] So then, the first question: what caused the appearance of the Sirena-2?

[Answer] First and foremost the considerably increased year-to-year volume of air shipments, which was becoming more and more difficult to handle. That is why the Ministry of Civil Aviation, in conjunction with the Ministry of Instrument Making, Automation Equipment and Control Systems [Minpribor], set out to modernize the Sirena. The task was posed to create a faster-acting and, therefore, more productive system that would serve not only the airports of Moscow, but would acquire nationwide significance. The basis of the Sirena-2 system was the SM-2-model machine, which incorporated the latest achievements of microelectronics and was more perfected than the second-generation computers.

[Question] But, after all, the abbreviation SM means "small computer system." It is based on small-sized computers that find broad application for industrial-process control, processing the results of scientific experiments etc. But in this computer memory, it can be said, is the whole airspace of the country, thousands of air corridors, millions of passenger seats...

[Answer] Though these machines are small in size, they possess quite substantial capabilities. The developers of the Sirena-2--the Institute of

Control Problems of Minpribor and the MGA Main Computer Center--built the ASU [automated control system] in such a way that several machines are in operation simultaneously and that optimal interaction among them ensures the reliable operation and high efficiency of the Sirena-2.

[Question] And why, let's say, didn't the specialists take the simpler route of using such mainframe computers produced in our country as, say, the YeS-1050?

[Answer] That route is also not ruled out. But practice showed that for the creation of the Sirena-2 system family, accessible to large, medium and small cities, it was most expedient to form it from computer complexes made up of a collection of individual "building blocks"--SM-2-type computers. This not only made possible a lessening in the cost of the computer complexes, but also substantially reduced operational and maintenance expenses. For example, six machines are operative in the Moscow Sirena-2 center, three are enough in Kiev, and there are just two in Lvov. I would especially like to note that progressive methods of planning such systems were utilized in the creation of the Sirena-2. We have at our disposal an ASU that meets world standards. And this is not only our evaluation, but the evaluation of specialists of major world airlines.

[Question] How many cities are there in our country overall where the ASU has taken on the responsibility for seating?

[Answer] Nine such centers are already in operation. Besides those named above, they are Leningrad, Kuybyshev, Minsk, Riga, Sverdlovsk and Rostov-on-Don. The Sirena-2 of each center serves dozens of other cities in its region. Consoles, ticket-printing apparatus and information screens are installed behind which work cashiers and dispatchers. And insofar as all of the centers are linked to each other, more than one hundred cities of the country have acquired the capability to serve air passengers in a practical fashion.

[Question] With the old Sirena, a number of entries were made by hand after the ticket was printed automatically--the passenger's first, middle and last names, the numbers of the payment documents etc. Now that even these operations are carried out electronically, what is the average time spent serving a single passenger?

[Answer] That depends on a number of factors, first and foremost the professional competence of the operator.

[Question] Valeriy Ibragimovich, what other tasks can the Sirena-2 execute besides the automated sale of tickets?

[Answer] One of them is the planning and administration of ticket sales. The system "knows" the aircraft traffic schedule for a year in advance and "has" information on all changes in the schedule, the number of seats, the average baggage weight on every route etc.

The Sirena-2 also generates a printed summary on the progress of ticket sales. From it we can discern in advance a shortage of seats on this or that flight--

in other words, unsatisfied demand. Based on this machine analysis, decisions are made on additional flights. At the same time, aircraft that are departing without a full load are revealed, and we can make suggestions for correcting the schedule. In this way, with the aid of the Sirena-2, flights can be controlled proceeding from their economic expediency.

These data are transmitted to the Central Scientific Research Institute of Civil Aviation Automated Control Systems and are utilized to compose the schedules for the next year.

In addition to passenger traffic, the Sirena-2 aids the reservation of capacity for urgent and perishable cargo, for which purpose there are consoles at the cargo service as well.

I would point out that the functioning of the ASU itself is easily monitored. Each of the millions of operations are recorded in machine memory archives and can be easily extracted when searching for a seat number, flight, and time of ticket sale.

And finally, we have extensive statistics on hand: on ticket sales by flight, on seat availability, and on the operations of subunits and operations. Practical and long-term operations plans are being made up on this basis and the structure of Glavagenstvo [Central Passenger Ticketing Agency] is being improved.

[Question] How will the Sirena-2 be further developed in the 12th Five-Year Plan?

[Answer] Its geography will be considerably expanded. New centers will appear in addition to those already in operation: Alma-Ata, Yerevan, Krasnoyarsk, Simferopol, Tashkent, Yakutsk, Khabarovsk, Odessa. Moreover, consoles will be installed in many rayon and oblast cities. As a result, by 1990 the "ambassadors plenipotentiary" of the Sirena-2 automated system will be operating in more than two hundred of the nation's cities.

[Question] Flying from Moscow--the country's major transportation center--to another city, people often want to know the schedule of the rest of the flight. Is the output of such information by automated inquiry service planned?

[Answer] In practice, this task is already resolved. The increase in computer memory, the technical capabilities of which in the Sirena-2 I have already mentioned, makes it possible to obtain information on any flight of the Aeroflot central aircraft traffic schedule at any cashier's post, information bureau or even by telephone. What is more, this can be done not only in Moscow, but in any city in the country where the "rays" of the Sirena-2 reach.

[Question] The draft of the Fundamental Areas of Economic and Social Development of the USSR for 1986-90 and for the period to the year 2000, submitted for broad discussion, reveals clear prospects for the future

development of the country. Can you say what levels automated ticket sales and flight planning will achieve by the day we enter the third millennium?

[Answer] Thanks to the broad utilization of the achievements of scientific and technical progress, we are planning to incorporate the Sirena-2 into all of the cities and populated areas of the country that are linked by Aeroflot routes over the next fifteen years. Clearly, by then the Sirena-2 family will become the Sirena-3 or Sirena-4. After all, the renewal time in computer technology is decreasing with the years. Along with miniaturization, it acquires ever faster operation and ever larger, practically inexhaustible amounts of memory.

It is pleasing to note that bold ideas for modernizing the Sirena-2 exist among the active membership of the designers and engineers with whom we collaborated. Some of the proposed solutions seem fantastic sometimes. But, as often happens, what seems impracticable and unlikely today becomes reality tomorrow. Such are the laws of scientific and technical progress that provide the basis for building plans that progress further.



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CIVIL AVIATION

## UPGRADES GIVE Il-86 CATEGORY 2 WEATHER MINIMUM RATING

Moscow IZVESTIYA in Russian 8 Mar 86 p 2

[Article by V. Belikov: "The Il-86 Airbus: Flying into Weather Unfit for Flying!"]

> [Text] Don't be surprised henceforth if the weather appears to have deteriorated completely on the day of your flight on Aeroflot's flagship, the widebodied Il-86, but the flight takes place according to schedule.

Employees of the OKB [Experimental Design Bureau] imeni S. Ilyushin, jointly with staff members of the Scientific Experimental Center for Air Traffic Control Automation and crews of test pilots from the GosNII GA [State Scientific Research Institute] of Civil Aviation have successfully completed an extensive series of check flights, confirming the feasibility of confidently and safely operating the 350-seat aircraft under so-called Category II weather minimums. They correspond to the visibility of ground reference points from the cabin of a descending aircraft from an altitude of 30 meters and for a distance of 400 meters. Until this, Il-86 pilots were cleared for landing only if they saw the runway from an altitude twice as high and a for a distance twice as long.

"Like no other passenger aircraft," says N. Timoshok, deputy chief of the scientific experimental center, "the Il-86 needs to be have all-weather capability. After all, it serves the most popular and heavily traveled air routes."

The builders of the aircraft had fitted it out "from its birth," so to speak, with a combination of equipment for an automatic approach under Category I weather conditions--a ceiling of 60 meters and visibility straight ahead of 800 meters. The use of such a system in conjunction with appropriate radio facilities at airports has ensured high regularity of airbus flights according to schedule.

Now a combination of domestic on-board and ground-based equipment which has been even further perfected and functions precisely has undergone thorough testing; it automatically controls the descending aircraft until the instant that the pilot sees the ground as though from a 10-story building, when he takes control and lands confidently.

"I want to emphasize especially," added Honored Pilot of the USSR Zh. Shishkin, "that the entire automatic approach process takes place under the continuous supervision of the crew. Past tests of the Il-86 have repeatedly confirmed the ability of the airbus to arrive on time at its destination airport or to safely execute a missed approach at minimum altitude.

After appropriate training, Aeroflot pilots on scheduled flights will be making use of the methods of landing under conditions which they now describe as "Airport closed because of bad weather."

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MOTOR VEHICLES AND HIGHWAYS

# GAZ-53-12 TRUCK FEATURES

Moscow ZA RULEM in Russian No 11, Nov 85 p 12

[Editorial under the "Soviet Technology" rubric: "Half a Ton Larger"]

[Text] The trucks of the Gorkiy Motor Vehicle Plant are our largest. They make up about 70 percent of the rural motor vehicle fleet. Therefore, any upgrade, say, of such a popular vehicle as the GAZ-53A, aimed at improving its operating characteristics always involves appreciable economic repercussions. The improvements made in recent years were fairly extensive and also involved changing the model designator from GAZ-53A to GAZ-53-12.

Most of the Gorkiy trucks are operated on class 4 and 5 roads. Their axial load on the road is below the maximum of 6,000 kg. The GAZ-53A's full load on the front axle is 1,810 kg and 5,590 kg on the rear. If the truck's carrying capacity is increased by 500 kg, the axial load will correspond precisely to the standard limit. The economic advantages promised by such an increase in carrying capacity are obvious. As for the durability of construction, as operating experience has shown, the model GAZ-53A is noted for a high efficiency of material usage, and with a relatively low weight the truck has a definite strength reserve.

Increasing the carrying capacity by half a ton is not simply a pen stroke in the specifications. A series of measures are needed, involving design, production, and supply, if you want the truck to remain equally as strong and durable as before. Therefore, they reinforced the GAZ-53A's springs, frame components, and front axle cross-member. The new cross-member, for example, is not only stiffer and stronger than the old one, but is also 14 percent lighter. This results in an annual savings of about 1,200 tons of rolled stock.

In the upgrade it was important not only not to lose the strength in the design, but also to ensure durability. The period before the first major overhaul of the GAZ-53-12 on the whole is 250,000 kilometers, but for the GAZ-53A it was limited by the ZMZ-53 engine, which had a service life of 200,000 kilometers. Let us note that the work to increase the engine's durability was accompanied by improvements aimed at improving economy.

Thus, the ZMZ-53-11 engine was given cylinder heads with an increased compression ratio and a vortex motion of the mixture; they are marked with the letter "B" on the outer intake ports. Combined with the changed gas distribution phases, the K-135 carburetor having a "leaner" adjustment, a new intake manifold, and a closed crankcase ventilation system, this has reduced fuel consumption by 5-7 percent and the content of toxic substances in exhaust gases by 15-20 percent. At the same time, the engine's maximum power output increased nearly 5 percent.

In order to increase its reliability, for the cylinder sleeves they used abrasion-resistant IChG-33M cast iron, reinforced the clutch casing, and changed the lubrication system. Instead of a two-section oil pump, they introduced a more reliable one-section pump, and the previous centrifugal oil filter was replaced with a "Regotmas-440A-1-05" full-flow oil filter with a replaceable paper element.

To a considerable extent, the most important parts of the upgraded truck are still interchangeable with its predecessor. The majority of the fitting dimensions in the assemblies and units remained unchanged.

Even with parts of the running gear being reinforced and a redesigning of number of elements (lining the radiator with a different grill pattern, tow hook, and others), the vehicle's weight remained the same as the GAZ-53A--3,250 kg. This means that according to the carrying capacity to equipped weight ratio, that is, the weight utilization factor, the GAZ-53-12 is practically on the same level as the ZIL-130-80, the record holder for this indicator among trucks with sideboards.

SPECIFICATIONS OF THE GAZ-53-12

General data: wheel arrangement--4X2; weight fully equipped--3,250 kg; carrying capacity--4,500 kg; top speed--80 kmph; fuel consumption at 40 kmph--23.4 liters per 100 km; fuel capacity (A-76 gasoline)--90 liters; period until first major overhaul--250,000 km. Dimensions: length--6,395 mm; width--2,380 mm; height--2,220 mm; loading height--1,350 mm; minimum ground clearance--265 mm; wheelbase--3,700 mm; front wheel track--1,630 mm; rear wheel track--1,690 mm; tire size--8.25-20 inches. Engine: model ZMZ-53-11; 8 cylinders; 4,254 $cm^3$ displacement; 7.0 compression ratio; K-135 carburetor; 120 hp/88 kW at 3,200-3,400 rpm; torque--29 kgf·m at 2,250-2,500 rpm. Transmission: single-disk dry clutch; four-speed gear box with third and fourth gear synchronizers; hypoid final drive with 6.83 gear ratio. Controls: steering--Hindley screw and three-ridge roller; hydraulically operated drum running brake with a hydro-vacuum booster; mechanically operated drum parking brake. Running gear: rigid-axle suspension of all wheels with lengthwise semielliptical leaf springs and with hydraulic with telescopic shock absorbers on the front wheels.



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MOTOR VEHICLES AND HIGHWAYS

## AUTOMOBILE TIRE SHORTAGE EXPLORED

Moscow ZA RULEM in Russian No 11, Nov 85 pp 6-7

[Article by P. Menshikh, chief of the ZA RULEM correspondence department: "How Can You Drive Without Tires?"]

[Text] A THREE-YEAR WAITING LIST

They are right when they say it is easy to reason when it does not affect you. But it affected me personally one and a half years ago on a sunny day in June. Evildoers had stolen the left front wheel of my newly purchased vehicle. While I was reporting the loss to the police, they fearlessly removed the left rear wheel in broad daylight that same day. This is also when I first truly felt that there was a shortage of automobile tires. There simply were none for sale. Calls to relatives and friends in other cities only resulted in amazement--they had not seen tires at the counters for several years. From all appearances it was clear from that I would have to expend considerable time and effort to make the car fit to drive again. At first there was nothing left to do but put the car in a garage and set out to find the missing tires. Jumping ahead, I will say that this did not result in any detective story tracking down the culprits who stole the tires. Thank you, the workers at the Voroshilov RUVD (Rayon Directorate of Internal Affairs) of Moscow explained to me how unproductive this would be.

There is more. I spent the entire day at the Moscow store Avtomobili. I stood in a long disorganized line which slowly moved toward the counter where they entered me into an even longer, but more organized line. My number turned out to be 63,879. Nearby they were talking about how long they would have to wait for the tires now. Nevertheless, you must admit that we Muscovites are better off, for example, than the inhabitants of Moscow Oblast whose names are not recorded anywhere. We are far better off, say, than the inhabitants of Kiliyskiy Rayon of Odessa Oblast--the sequence there depended... on the number of eggs in stock. Those who really needed tires, bought the eggs for 1 ruble 20 kopecks for 10 and sold them to the procurement office for 69 kopecks. After this they could consider themselves on the waiting list.

All this was known to me as an associate of the ZA RULEM editorial staff inasmuch as I had just started preparing material concerning the tire

shortage, and I demonstrated a journalistic interest in all the available facts concerning it.

But somehow I did not believe that I would have to wait more than a year. The chief merchandising specialist of the Moscow store Avtomobili, V. Shuin, shattered my hopes. It turns out, the store could fill only one-third of the orders received, which meant that I had to wait no less than about 3 years. This is not so long compared to the situation in which, according preliminary estimates, car enthusiasts of Simferopol may find themselves. According to information from the trade department of this city, "...in 1985 the demand for tires was only 8-10 percent satisfied."

Trade workers in Moscow, Odessa, Simferopol, and many other cities note the ever-increasing shortage of automobile tires. However, as a rule, in sending their orders to higher organizations, they request one-third to one-half as many as the waiting list requires. As they explained at the Moscow store Avtomobili, they do not see every person on the waiting list as a potential purchaser. When I reasoned that people would not randomly put their name on such a long waiting list and that it was necessary to have a small reserve in order to always have them on hand, I was referred to the higher organization. With that, I left the store which operates under the rule that "goods will not become stale if there is a long waiting list for them."

Before proceeding to the USSR Ministry of Trade, which is allocated 90 percent of the marketable stocks of motor vehicle tires, I will tell you about my attempt to purchase them at enterprises of the "Avtotekhobsluzhivaniye" (Motor Vehicle Maintenance) system, which receives 10 percent of the marketable stocks. The store salesmen at technical servicing station (STO) took personal offense when asked if they had tires for "Zhiguli" cars. One can only surmise as to where these 10 percent of the marketable stocks disappeared. A follow-up of a complaint from reader M. Chernyy from Kuybyshev showed to what extent the "Avtotekhobsluzhivaniye" system is not adapted for trade with such a shortage. It has been established by workers of the Administration of Internal Affairs of the Kuybyshev Gorispolkom that 600 of the 1,500 sets of size 6.15-13 car tires received by the Kuybyshevavtotekhobsluzhivaniye Association in late 1984 were sold illegally through the "back door" of STO store No 5. Association director A. Yelesin and chief engineer N. Konovalov were personally involved in this. In addition, I quote an excerpt from a group letter from car owners of the village of Enom of Krasnodar Kray: "It is high time to set up a waiting list for tires everywhere and sell them under one set of rules. The problem is not as simple as it seems, but we cannot put up with the existing situation."

"JUST A LITTLE" SHORT

I shared my thoughts regarding the need to have tires on sale "with a reserve" with deputy chief of the Department of Motor Vehicles, Motorcycles, and Sporting Goods of the Main Administration of Cultural, Consumer, Household, and Haberdashery Goods Trade of the USSR Ministry of Trade, N. Bogateyev. He set me straight: "It is better when we have just the right amount or are just a little short." Unfortunately, the demand for tires is also determined according to this principle at various stages. The store, as we already

remarked, understates it by one-third. In satisfying the orders of the union republics, at the Ministry of Trade tney do not philosophize over the characteristics of local roads and operating conditions. Here they equalize the demand by calculations, using basic data: the number of motor vehicles, an average annual mileage of 10,000 km, and an average tire life of 40,000 km. The formula of the Gosplan, which reviews the orders of the Ministry of Trade is even more "to a T": the average tire life is increased from 40,000 to 50,000 km. Meanwhile, any owner of an early model "Zhiguli" or "Moskvich" will tell you that the diagonal design tires now last 30-40,000 miles, rarely longer.

The editorial staff requested the motor vehicle testing grounds of the Central Scientific Research Institute of Motor Vehicles and Motor Vehicle Engines to verify these figures. It turns out that the average operating figure for the life of such large tires as the I-151 and the M-145 is 32,000 and 28,700 km, respectively. But perhaps the "50,000 km" figure is influenced by metal cord radial tires? From all appearances, it is not. The percentage of radial tires in the overall production volume in the current 5-year plan was comparatively small: initially 12 percent, and 24 percent in 1984. As for the tire life, the average obtained at the testing grounds, for example, 46,500 km for the model MI-166, merely confirms the opinion of our readers that the potential capabilities of these tires are not always realized in practice. Experience is one thing, but calculating by the principle that "it is better when we are just a little short" is another.

Now we are 2 million tires short. Simple arithmetic can show how this came about. How many tires were needed for sales in 1981? Let us use the known formula in the Ministry of Trade and the Gosplan: 9 million (the number of privately owned motor vehicles for that year) X 10,000 (the average annual mileage in kilometers) X 4 (continually operating wheels) : 40,000 (the average life in kilometers of the main diagonal design tires of that time) = 9 million tires. Counting the retreaded tires sold as new ones, there were 6.6 million tires sold. It turns out that each vehicle gets 0.73 tires, and car owners were already feeling their shortage. It had an even more acute effect as tire production lagged behind the increase in the number of automobiles. In 1975, there was one tire sold for each automobile. In 1981-1982, this figure fell to 0.73. According to calculations of the USSR Ministry of Trade, the gap between demand and the allocated stocks for automobile tires increased to 2 million by 1983 and remained in 1984.

Now it is clear that the automobile tire production program in the current 5-year plan was made up without taking into account the ever-increasing demand for them. The marketable stocks increased by 1.3 million this year. This means that 0.86 tires will be sold for each automobile, but there will still be a shortage. And at intersections, how many more cars will we encounter with "bald" rubber and being operated in defiance of all safety requirements with only one hope: "perhaps I can make do."

THERE SHOULD BE NO SHORTAGE!

In talking with me, workers of the USSR Gosplan, the Soyuzshina All-Union Production Association (VPO), the Scientific Research Institute of the Tire

Industry (NIIShP), and the Yaroslavl Tire Plant were astonished: "There should not be a shortage now." The demand, according to their calculations, should be satisfied. But when it came around to how reliable these calculations were, at the Ministry of Trade they put the blame on the Soyuzshina VPO and the NIIShP, and at the NIIShP they blamed the Ministry of Trade and the All-Union Scientific Research Institute studying consumer demand and market conditions. What is a motorist to do when he suffers because the responsible individuals cannot figure out how many tires should be put on the market?

The following comes from official letters which the editorial staff received from the chiefs of the Soyuzshina and Soyuzremshina all-union production associations, M. Mitrofanov and N. Serbinov: "The tire industry has at its disposal production capacities and qualified personnel and is capable of fully meeting the demand for automobile tires;" "The existing capacities are fully satisfying the demand for retreading tires." What demand do the administrators of the tire industry have in mind? If it is the one which they reduced as it moved from office to office, then their subordinate enterprises need not worry. As in previous years, they will just overfulfill all plan quotas. But, judging from appearances, the situation is turning out differently. In the next 5-year plan the tiremakers will have to clear a nearly 2-million shortage in automobile tires.

Another question arises, concerning tire quality and their actual life. Production of a high-quality product would to a considerable extent reduce the tension of plans of forthcoming deliveries. A new procedure, which would increase the responsibility of the manufacturing plants for the quality of their product, can play a special role in this. It involves replacing a defective tire, a model IYa-170 for example, with a new one free of charge up to 10,000 km. If it has more than 10,000 km on it, but less than the guaranteed standard of 40,000, the manufacturer having such tires can replace it with a new one, provided that the purchaser pays for the cost of the actual mileage.

But the consumer does not yet have confidence in the objectivity of examining the causes for the premature wear. As a rule, the claims boards include only representatives of one of the sides concerned. They often have "doubts" as to the correct operation of the tires. At the same time, they are not concerned about how to provide consumers with the necessary information in this regard. The "Rules for Operating Motor Vehicle Tires" published in 1983 were circulated in such a small number that at the Soyuzshina VPO they could not even find a copy for the editorial staff. Our reader Yu. Shipilov from Moscow is right when he writes: "I buy the simplest meat grinder and get 4 pages of instructions, but 5 tires costing 40 times as much come with nothing." We would hope that at the tire plants and at the motor vehicle stores they will finally take notice of this disparity and will sell tires with operating instructions.

A reserve such as retreading has still not been fully incorporated into the struggle with the tire shortage. The chief of the Soyuzremshina VPO, N. Serbinov, notes: "The existing capacities are not being fully utilized in connection with an insufficient amount of repair stock." This is not

surprising. More than a million of the expensive IYa-170 radial tires produced each year by the Yaroslavl are unfit for repair. According to NIIShP data, 30-50 percent of the MI-166 radial tires with metal cord can be retreaded. From last year's experience in recapping them, we know that one-third of them were returned to the sender as unfit for recapping. Where is the source of the repair stock?

What is important for the purchaser in the end is the readiness of industry to meet the demand for automobile tires. It is clear that will be for tires not to the plant, but to the store. It turns out it is precisely through trade that it will require industry to meet the demand both in product amount and assortment so that it corresponds to the operating conditions. In reality, the stores do not yet long to be the intermediary between them. There are no tires at the counters, the salesman yawns as if it does not concern him, but he still gets paid. Should he not champion the customers' interests before industry? Why? However many tires are produced is how many he must sell; they are easy to sell, there are no overstocks, and he can still call friends who will come over with gratitude. But the ordinary customer will buy even a tire from the Yerevan Tire Plant. He has no idea of the number of complaints received concerning this product, for example, by the magazine ZA RULEM. The store will not take back a defective tire for any reason, and the consumer will take it to the post office, maybe, to mail it from the other end of the country to the manufacturer. It is possible that the plant will not recognize the claim. It is always easier to remain one on one with the customer than it is to argue about product quality with the whole trading organization.

In a situation of an absence of the store's responsibility to the customer and the undemanding attitude of trade toward industry, there is now a shortage of 2 million tires. There is still hope that the USSR Gosplan, the Ministry of the Petroleum Refining and Petrochemical Industry, and the Ministry of Trade will take notice of this alarming fact and take steps to eliminate the shortage of tires for automobiles. After all, this involves the interests of millions of Soviet working people who have acquired automobiles in order to drive them.



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MARITIME AND RIVER FLEETS

## MARITIME FLEET MINISTER ON SECTOR ACHIEVEMENTS, PLANS

Moscow MORSKOY FLOT in Russian No 10, Oct 85 pp 2-7

[Article by Maritime Fleet Minister T. Guzhenko: "The Course for Speeding Up Scientific and Technical Progress"]

[Excerpts] Maritime transportation workers, like all Soviet people, are working with great enthusiasm on implementation of decisions of the April and July (1985) plenums of the CPSU Central Committee and are making preparations for the regular 27th CPSU Congress. An important stage in this work was the June conference at the CPSU Central Committee, which discussed the basic questions of speeding up the country's socioeconomic development on the basis of scientific and technical progress, qualitative transformation of the material and technical base of the national economy with the aim of further raising the well-being of the people, and strengthening the economic and defensive might of our state.

Along with substantiation of priority tasks, which face the party and the people, the conference stressed the increased responsibility of supervisory personnel, the party aktiv, and all communists for decisive and steady implementation of measures outlined by the party with regard to speeding up scientific and technical progress, strengthening order and organization and state and labor discipline, and reorganizing the management of economy and the entire management system.

A task was set to use all reserves for a dynamic advancement in strategically important directions and in a short space of time to ensure structural reorganization of production and of the entire economic mechanism. Ensuring a steady growth in yield on capital is of great significance in this work.

The fixed capital value of maritime transportation has reached R18 billion by the beginning of 1985. During the first 4 years of the current five-year plan, its profitability amounted to 15.7 percent, whereas in 1980 it was 13.3 percent.

The existing growth in yield on capital cannot fully satisfy us. It could be higher if labor collectives and the central administrative machinery of the ministry would devote more attention to this matter and if all fixed capital and, first of all, ships and transshipment complexes of ports were used more efficiently.

The basic part of capital investments in the sector is directed at acquisition of the fleet. This meets the task with regard to concentration of resources on main directions. In 4 years, the fleet was replenished with 156 ships with a total deadweight of more than 2.6 million tons. The increased technical and economic qualities of new ships, their specialization, increased reliability, and acceleration of the turnover rate by means of intensification of all components of the transportation process--all of this can and should ensure a much high carrying capacity of the fleet. The new ships are more economical with regard to fuel expenditure, conform to contemporary requirements with respect to reduction of labor input in their operation (and consequently, also reduction in the number of crews), and as a whole contribute to increased labor productivity in maritime transportation.

Substantial changes have also occurred in ports of the sector in 4 years: 45 powerful transshipment complexes with an annual capacity of 13.5 million tons of cargo were put into operation, berthing lines were lengthened by 5.6 km, and ports were equipped with highly productive materials handling mechanisms. Raising the intensity in ship processing is one of the main reserves in further intensification of fleet operations. Considerable funds will also be invested in the development of port facilities in the 12th Five-Year Plan.

At the same time, transshipment complexes, berths, equipment, and means of small-scale mechanization are not being used efficiently everywhere in ports. Portal cranes, automatic and electric loaders, and other equipment quite often stand idle owing to breakdowns and inept organization of labor on berths.

Today, the yield per R1 of fixed capital in most ports does not exceed 30-40 kopecks. Supervisors of many ports have not been devoting enough attention to modernization and capital repairs of existing capacities and to establishing specialized sectors for the repair of hydraulic engineering structures. The depths on approaches and at berths are sometimes less than those planned and owing to this the small-tonnage fleet was diverted to unloading large-tonnage ships and the demurrage of ships while waiting to be positioned at berths increased.

The fixed capital of our ship repair enterprises has increased 1.5-fold since 1975, their production capacities have increased by 37.5 percent, and the output of production in NSO has increased 1.5-fold. In 10 years, by 1986, the growth of labor productivity at plants of the sector is expected to amount to almost 50 percent. Despite the fact that output norms in ship repairs were made more stricter by 30 percent, they were fulfilled by most SRZ. All of this has made it possible to speed up the repairs of the fleet. Some other indicators could be cited which testify to the positive changes in the ship repair industry.

However, the growth in the volumes of repair work on ships of older generations and complication in servicing new highly automated ships demand that we radically improve fleet operation methods and the techniques and organization of ship repairs.

According to TsNIIMF calculations, which were made by taking the aging of ships into account, the fleet repair time may increase under existing operation methods,

and expenditures for technical servicing and repairs per 1 ton of deadweight may increase by 10-15 percent. This situation must not be permitted! It is necessary on the basis of establishing a scientifically sound program and improving fleet operation and ship repair techniques to reduce the volume of technical servicing by means of more purposeful development of its continuous forms without withdrawing ships from operation. Of course, this will require strengthening the fleet technical service bases of shipping companies, which should be reflected in plans for modernization and development of ship repair enterprises and replenishment of their equipment in the 12th Five-Year Plan.

For the purpose of effective utilization of capital investments it is necessary to continue their concentration on underway projects. During the 11th Five-Year Plan, the volume of uncompleted construction in maritime transportation has not exceeded the norm established for the sector. Virtually with the same volume of construction and installation work in the draft plan for the 12th Five-Year Plan it is planned to considerably reduce new construction. Development of coastal facilities is mainly oriented toward building up production capacities of ports and ship repair plants, first of all, by modernization and reequipment in order to considerably increase volumes of production with a minimum of capital investments.

We will begin expanding operating enterprises and all the more building new ones only in those cases when reequipment and modernization reserves are completely exhausted or there is a need to establish entirely new transportation systems. In so doing capital investments will be directed, first of all, toward construction of those production facilities, complexes, and projects which will be able to yield a return within the briefest possible periods.

The June conference at the CPSU Central Committee on speeding up scientific and technical progress noted the necessity of developing new technical means and equipment on one's own without resorting to the help of other ministries. The Minmorflot has such experience. Without waiting for the commissioning of capacities of the shipbuilding industry, we have organized the output of lighters and containters in Kiliya and and Ilichevsk. The Aralsk SRZ has achieved successes in providing ro-ro transportation and technological systems with trailers and fastening means, which were formerly purchased abroad. However, this positive experience has been used insufficiently, and the construction of specialized lighter production facilities at the Loksaskiy and Slavyanskiy Plants has been intolerably delayed.

The progress of work on the draft plan for the 12th Five-Year Plan in labor collectives of shipping companies, ports and SRZ cannot be recognized as satisfactory. The ministry has informed shipping companies and enterprises in time about the preliminary limits of construction and installation work and has proposed that they be discussed in labor collectives and with planning and contractual organizations. The materials received from shipping companies have shown that in most cases the tasks with regard to intensive development of enterprises and direction of allocated funds, first of all, toward modernization and reequipment as well as toward projects under construction have not been taken into account in a proper manner. These shortcomings must be completely eliminated during the final revision of the plan for the 12th Five-Year Plan, in which connection particular attention should be devoted to projects of social and everyday use, first of all, housing.

Strengthening during the years of the past five-year plans of the material and technical base of the fleet, ports, and ship repair enterprises has made it possible for the sector to completely satisfy requirements of the national economy in maritime transportation of cargo, including to regions of the Far East and the Far North, where maritime transportation plays the main role in ensuring national economic shipments. Government tasks for shipment of foodstuffs and many other kinds of cargo were fulfilled. Large diameter pipes for the construction of main gas pipelines are being delivered in excess of the tasks. In accordance with foreign trade requirements, cargo is delivered to Cuba, Vietnam, and other socialist countries.

As a whole plans for the first 4 years of the 11th Five-Year Plan were fulfilled for coastal trade by 104.2 percent and for foreign shipping in basic indicator by 102.4 percent. The plans of industrial enterprises for the output of production in NSO were fulfilled by 100.4 percent and for profits by 104.5 percent. Labor productivity in transportation and loading and unloading work was increased by 5.2 and 14.3 points respectively, surpassing the tasks for the five-year plan.

However, we have exhausted far from all reserves in the matter of transportation process intensification, and have even at times allowed substantial blunders. With the increase in value of the fixed production capital during the years of the 11th Five-Year Plan by 26 percent, the growth of the basic production indicator in comparable prices amounted to 20.1 percent, which testifies that development of the sector in the 11th Five-Year Plan was primarily of an extensive character. One of the main reasons of this are losses of fleet operational time owing to unproductive layovers under existing norms of loading and unlolading intensity, which already do not correspond to new technical and economi parameters of ships and transportation and technological systems.

For the dry cargo fleet the share of layover time in ports has amounted to more than 50 percent, including owing to unproductive layovers to 32 percent. The layover time of specialized ships, the main advantage of which, as is known, is the possibility of fulfilling loading and unloading operations more rapidly, is intolerably great. It is necessary to wage a struggle for reduction and complete elimination of unproductive layovers of ships not from time to time but constantly and in a purposeful manner.

An essential factor in raising the utilization efficiency of the fleet is extension of the period between repairs by improving operation and care of mechanisms and machine units and having repair work done by crews or by plant brigades assigned for a voyage, and when it is possible during cargo handling operations in a base port without withdrawing a ship from operation.

There are many examples of such diligent attitude toward operational time of a ship on the part of management workers, ship crews, and plant workers. The crews of the ships Vladimir Il'ich, Zadonsk, Tanya Karpinskaya, and other ships have been waging a persistent struggle for maximum efficiency of every voyage, finding reserves for transporting cargo in addition to plan tasks, manifesting initiative and shrewdness in not allowing empty runs, participating in cargo handling operations, and initiating competition with port and railway workers aimed at achieving most rapid ship processing in a port. However, the experience of such collectives has so far not been made accessible to all.

It is not ruled out that in the process of developing our complex and varied economy some "faults" may occur and the so-called "bottlenecks" may appear. The task consists in promptly "widening" such places in the transportation process, discovering and eliminating the slightest obstructions and unproductive layovers of ships, and constantly ensuring a systems, comprehensive approach to servicing the fleet by striving for maximum efficiency of every ship on every run.

Despite certain achievements in comprehensive mechanization of cargo processing, whose level for ports as a whole has exceeded 95 percent, many labor-consuming operations are still being performed manually. With a considerable saturation with mechanisms of the cargo operations front, only 35 percent of labor of dockers-machine operators is expended at the present time on operating transshipment and transport machines, the remaining 65 percent is manual work of which 25 percent is hard work involved in moving cargo. Is this not proof of the lag of the loading and unloading operations technology and of insufficient attention on the part of supervisors of ports to most rapid fulfillment of the special purpose program aimed at shifting hard manual labor on the shoulders of machines?

In transshipment of cargo in bulk without packaging and of free-flowing bulk cargo the level of comprehensive mechanization in ports has exceeded 98 percent, but up to the present time millions of man-hours of hard physical labor are spent by workers to clean grain rooms on ships and railcars from cargo remnants. The situation is particularly bad with the unloading of cargo which has become frozen hard and firmly packed. Here there is an obvious defect of our scientific and research institutes. Valuable proposals by innovators with regard to defrosting cargo by heating and utilization of mechanical means for unlading cargo which has become firmly packed are being introduced slowly, which to a great extent is due to the fault of workers engaged in scientific and technical information and specialists of the Glavflot of the MMF.

Elimination of unproductive manual labor in loading and unloading operations in maritime ports is also one of the most important tasks in the social sphere and in the matter of raising labor productivity and intensifying the work of ports and the fleet, particularly in the Arctic and the Far East.

We also have many shortcomings in the organization of ship repairs. Workers of plants and labor collectives must adopt measures aimed at eliminating them, accelerating ship repair work and raising its quality. An analysis has shown that that the stock of machine tools of the SRZ has become obsolete to a considerable degree. Plants have been slow in mechanizing hard manual labor, and progressive technological processes have been introduced without proper persistence. A serious lag has been allowed in the development of hull shops at the Krasnaya Kuznitsa (Arkhangelsk), Sovetskaya Gavan, Izmail and Kerch Ship Repair Plants. Production capacities at the Riga, Ilichevsk, Tuapse, Novorossiysk and Slavyanka Plants are being used inefficiently and considerably lower than the average sectorial level.

In 1984, the yield on capital at the Riga SRZ amounted to 19.4 kopecks in NSO per R1 of fixed capital, which is a third lower than the average in the sector.

Ship repair workers will have to do much with regard to building small vessels, lighters, and containers and expanding the variety and improving quality of consumer goods, replacement and spare parts for ships and port mechanisms, and equipment for capital construction. It is also necessary to engage more boldly in modernization of shops and enterprises, including by using own efforts without reducing the volume of ship repair work.

The June conference at the CPSU Central Committee directed attention to the necessity of decisive and bold introduction of new and more advanced technological systems, which are capable of increasing volumes of production many times during simultaneous economizing of manpower, physical, and raw material resources.

It is precisely such transportation and technological systems, the development of which has made it possible to replenish the fleet with specialized ships and equip ports with powerful transshipment complexes and terminals. Their development is the most contemporary and effective way of intensifying the entire transportation process and reducing national economic costs. In further improvement of management of transshipping centers and transportation and technological systems and active interaction with all related means of transportation and senders and recipients of cargo we see one of the main directions of maritime transportation activity not only in the years immediately ahead but in the long-term prospect as well.

During the 10th Five-Year Plan and particularly during the 11th Five-Year Plan, work was conducted on the initiative of the Minmorflot in developing pallet, container, ferry, ro-ro, lighter, and other transportation and technological systems.

During the years of the 11th Five-Year Plan, container shipments increased by 48 percent and shipments in packets by 7.8 percent. Shipments in containers and packets aboard specialized large-capacity ships are most effective in delivering cargo to regions of the Far North and Far East, out of the overall volume of container shipments in coastal trade nearly 90 percent has to do with these regions, including 70 percent with the Far East. Further improvement of the container shipment system on the Arkhangelsk--Dudinka route and in the direction of Magadan and Kamchatka is of important significance.

Great possibilities for raising the intensity of cargo operations in the Arctic basin open during processing of multipurpose ships of the Norilsk type by using air-cushion platforms and helicopters. Here we are faced with developing a kind of self-contained transportation and technological systems, such as the Norilsk, Astrakhan, and other types of ships are.

At the same time, it must stated frankly that the decisions of the 26th party congress and government resolutions on development of shipments in containers and packets are still being fulfilled unsatisfactorily owing to poor development of the material base by related kinds of transportation and enterprises--recipients and senders of cargo. Therefore, a considerable part of general cargo is packaged in maritime ports, where up to 40 percent of containers are also filled and emptied. There are also our failures to complete work in this matter: the

repair of containers has not been organized, work has not been completed up to now with regard to developing a container tracking system with the use of computer technology for this purpose, the turnover of containers is being reduced slowly and the questions with regard to loading packets in containers have not been solved, which quite often leads to breakage of containers and an increase in their turnover time. The Northern and Baltic Shipping Companies have been slowly introducing the system of packet and block packet shipment of lumber, including round timber and precut lumber, which has justified itself in practice long time ago. Our scientific research organizations are poorly linked to solving these sore subjects.

In 1984, our country's first lighter transportation system was put into operation in the Far East. The experience gained from operation of the hauling lighter Aleksey Kosygin has shown high efficiency of such shipments. This year, the new hauling lighter Indira Gandhi will be put into operation, which will operate in the Black Sea Shipping Company on the Black Sea--Indian and Pacific Oceans route. Small hauling lighters of the Boris Polevoy and Anatoliy Zheleznyakov type in the composition of the Soviet Danube Shipping Company have made a good showing from their first runs. But even here not everything is progressing as planned: a shortage of lighters is causing serious difficulties and the experience in operation of the hauling lighters Julius Fucik and Tibor Samueli, which are operating within the framework of the Interlikhter International Enterprise, is being poorly taken into account.

At the present time, a system of continuous plans-schedules of operations is functioning in 48 port transshipping centers according to the method of Leningrad transportation workers, whose inititive was approved by the CPSU Central Committee in 1978. The improved interaction of fellow transport workers within the framework of transshipping centers has made it possible without great additional expenditures to obtain an economic effect of millions of rubles, to say nothing of even greater savings in the national economy, which were obtained as a result of improved transportation service for enterprises, construction projects, kolkhozes, and sovkhozes.

The development of a unified plan for economic and social development of the transshipping center in Ilichevsk was a result of the initiative of Leningrad transportation workers. At the present time, this plan is being used as a basis for development of Ilichevsk City, which has made it possible to integrate sectorial and regional planning in accordance with contemporary requirements.

Extensive opportunities for improving the work of unified complex shifts in transshipping centers is provided by synchronization of work according to time of brigades of dockers-machine operators and railway workers on the basis of a sliding-scale schedule of 12-hour shifts The work of temporary party groups in unified shifts and other valuable initiatives are also directed toward this goal.

However, the advantages of transshipping centers are far from being used in full measure. The experience of Ilichevsk workers with regard to developing a unified plan for economic and social development of a transshipping center is being disseminated extremely slowly. All of us, transport workers, are slow in passing from words to deeds and in realizing some new important proposals, which

were recently made at the All-Union Conference on Transshipping Centers in Leningrad. In the interests of the country's national economy it is necessary to resolutely overcome excessive attention to departmental interests, to strive persistently for fulfillment of coordinated plans-schedules of operations, and to try to get every transshipping center working as a unified interdepartmental transportation association by moving cargo at a rapid rate with the least of expenditures.

An important role in this must be played by strengthening of coordination and interaction of fellow transport workers on a much large scale--within the framework of transportation and economic regions. The first steps have already been taken in this direction. The Odessa Obkom Buro of the Ukrainian Communinst Party at a joint meeting with the Minmorflot Collegium have approved a comprehensive special-purpose program for intensification of cargo shipments and improvement of passenger service in the Odessa region for the 12th Five-Year Plan. Transportation measures within the framework of the Leningrad territorial and sectorial program known as "Intensification--90" are directed at the same goals. Specific decisions on improving navigation in arctic and Far Eastern seas were adopted by the coordination council for transportation in the entire Far Eastern region. It is very important that this work is developed further.

The Party Central Committee has set the task aimed at introducing cost accounting on a broader scale and on this basis raising the responsibility and interest of labor collectives in final work results. One of the most important principles of cost accounting is most stringent economy of manpower, physical, financial, energy, and other resources.

Economy of manpower resources (and growth of labor productivity with it) is being achieved in the fleet by broad introduction of a method of work with reduced crews, which is now used by more than 80 percent of ships. The experience of the Latvian Shipping Company, which makes it possible not only to increase labor productivity but also to solve many social tasks, is being disseminated on an increasingly greater scale, it includes organization of rest, education of seamen, and so forth. An interesting and efficient work method with a reduced crew was found by Black Sea seamen (the crew of the motorship Ernst Thalmann). In each case it is necessary to find and introduce one or another form of work by taking into account the type of a vessel, the nature of runs and cargo, and the traditions and possibilities of a crew. However, some ships still have crews whose numerical strength clearly exceeds the requirements for ensuring proper operation of machines, mechanisms, and devices and safe navigation.

Considerable losses of manpower resources are also being permitted at some coastal enterprises. The idle time of workers is still great in ports of the Georgian, Sakhalin, Far Eastern and Caspian Shipping Companies.

The questions of conservation of power resources, materials, and financial means must be an object of daily concern of every seaman, port worker, and ship repair worker. A most stringent policy of economy should become a norm of work of every collective and creative work of workers brigades, engineers, councils of innovators, and bureaus of economic analysis should be directed at this. Thrift and

economical management are important conditions of intensification of our economy and absolute fulfillment of the five-year plan tasks. Nearly 1,000 ships of the transport fleet have taken up the initiative of crews of the motorships Severodonetsk and Konstantin Tsiolkovskiy with regard to reducing the expenditure of physical, manpower, and fuel and power resources. Considerable work, which was conducted in this direction at all maritime transport management levels, made it possible to reduce fuel expenditure by all means of the fleet in 1984-85 by more than 5 percent and to reduce the share of diesel fuel consumption in 4 years of the 11th Five-Year Plan by 5.6 percent, which in the final analysis released hundreds of thousands of tons of fuel for the national economy.

But it would have been wrong to be content with what has been achieved--every percent of fuel economy in the fleet alone brings millions of rubles to the economy's money box. Far from all reserves have been exhausted in this work: some shipping companies, enterprises, and organizations have not yet decisively turned the entire economic activity toward strengthening the policy of economy.

Conservation of resources is incompatible with facts of mismanagement. In 1984, serious violations and oversights were permitted in the organization of financial work. Above-norm stocks of physical resources for which no bank credits were extended and unnecessary physical assets have not been reduced at enterprises of the Far Eastern, Black Sea, Latvian, Estonian and Baltic Shipping Companies. Above-plan stocks of equipment which has not been installed are still great. Supervisors of shipping companies should devote more attention to drawing physical resources into economic turnover and to bringing to strict account specific persons who permit unnecessary purchases of technical means and materials and defects in work.

Considerable losses in maritime transportation are due to accidents. The basic reasons of unreliable shipments and accidents are violation of discipline, regulations and instructions, technical operation rules and so forth. Things are most bad with accidents in the Georgian, Novorossiysk, Northern, Caspian and Baltic Shipping Companies. It is necessary to use toward careless workers and violators of discipline the strictest possible measures and to strive for making navigation of ships safe and accident-free under any conditions.

The development of a modern highly productive material and technical base in the maritime fleet is being conducted in organic combination with improvement of the forms and methods of labor organization, which is one of the most important conditions of intensification. Successful planned solution of this task consisting of two indissolubly united parts will make it possible to link the achievements of scientific and technical revolution with the advantages of the socialist management system.

During the next five-year plan, the sector must conduct measures aimed at improving planning and organization of shipments and raising work efficiency of all maritime transport enterprises and organizations. Cost accounting relations will be strengthened and expanded and the responsibility for adopting and fulfilling plans will be raised. The role of economic incentives and levers in raising work efficiency of enterprises will be increased.

In 1986, it is planned to conduct an economic experiment in the Baltic, Latvian and Black Sea Shipping Companies. Its essence consists in raising work efficiency of enterprises by expanding their independence in the questions of planning and management, considerably reducing the number of indicators which are confirmed from above, and raising the responsibility of supervisors and labor collectives for fulfilment of plans. It is also planned to shift to formation of a plan on the basis of direct agreements with consignors.

In the light of the decisions of the April and July (1985) plenums of the CPSU Central Committee and the directives of the conference at the CPSU Central Committee with regard to questions of acceleration of scientific and technical progress it will also be necessary in the future to direct efforts at improving the work style of management staffs and personnel at all levels, reducing the flood of paperwork and accountability forms, strengthening control over fulfillment, and much broader introduction in management practice of electronic computer technology. Of special significance is the acceleration of work in developing a unified automated control system--ASU Morflot--and already raising today the yield from the developed subsystems.

Improvement of operational activity must be carried out by means of further development of continuous operations planning with possibilities of prognostication and comprehensive solution of questions with regard to organization of shipments and operations of the fleet and ports at all levels: from the central administrative machinery of the ministry, shipping companies and their services to every KhEGS, port, berth, and ship. Continuous plans-schedules of operations make it possible not only to achieve best organization of shipments but also to ensure constant control over their progress and over the work of every ship and port complex and are thus a reliable tool of optimum regulation of hauling and transshipping processes.

Development and functioning of this system is possible only on the basis of broad utilization of modern means of electronic cumputer technology. Maritime transport has at its disposal a network of computer centers, which are outfitted with quite good equipment, that are staffed with highly skilled specialists. However, the use of computer equipment in some shipping companies and ports cannot be regarded as satisfactory thus far, first of all, with respect to solving operational tasks.

The party has set great tasks with regard to raising the role of science in solving key problems of the country's economic development, intensifying entire social production, considerably increasing labor productivity, and deepening integration of science and production on the basis of broad and stepped up introduction in practice of latest scientific and technical achievements and leading experience.

Scientists and technologists of the sector's scientific research institutes and design bureaus are called upon to more actively assist production workers--seamen, port workers, and ship repair workers--in solving the tasks facing them. For this purpose it is necessary to disseminate more broadly the experience of the Black Sea TsPKB with regard to reaching agreements with production collectives and developing joint special purpose programs, as well as the experience of creative cooperation of seamen and scientists of the Black Sea Shipping Company on the coastal bulk carrier Zadonsk.

Professorial-teaching and student collectives of our higher educaional institutions should participate more effectively in speeding up scientific and technical progress in maritime transportation and in carrying out specific developments which meet the most acute needs of the fleet and coastal enterprises. A thorough revision should be made in the subject matter of degree and thesis work, both available and that which is being prepared, by striving to achieve its maximum conformity with vital requirements of production.

An important role must be played by efficiency experts and innovators of whom there are already more than 27,000 in maritime transportation. During the first 4 years of the 11th Five-Year Plan, the sector introduced 726 inventions and nearly 100,000 innovations with an overall economic effect of R109.7 million. Taking into account the tasks facing us, this work must gain a much wider scope.

Scientific and technical information is of tremendous significance in the matter of introduction of scientific and technical achievements and rapid dissemination of leading experience. Thus far we have not been using the best scientific and technical information methods that are available in the world and our country's practice, for example, with the use of computers, microfilming, and so forth. The periods for preparation of information pamphlets and technical propaganda films are often delayed and effective centralized issuance of posters, organization at enterprises of mobile topical exhibitions, and many other forms of scientific and technical information and propaganda, which have positively proven themselves in other sectors of the national economy, are almost not being practiced. A decisive reorganization of all this work is required of the V/O Mortekhinformreklama.

In speaking of science's role in speeding up scientific and technical progress, one cannot but turn one's attention to the lag in its development in the maritime fleet, in the sphere which is directed at stirring up of the so-called "human factor." I have in mind the conducting of research and utilizing in practice of scientific developments in the field of sociology, social psychology, ergonomics, maritime psychology, and so forth. We must fill this gap, first of all, by bearing in mind the placing of scientific basis under development of plans for social development of labor collectives, optimization of the habitation environment and the morale-psychological climate on ships, and preventive measures against accidents and injuries.

Employment of scientific methods in the practice of selecting, assigning, and training personnel, in work with people at any sector, and in all questions of developing labor collectives and forming an all-round developed personality of a seamen, a port worker, and a ship repair worker is a task which must be solved in close interconnection with the speeding up of scientific and technical progress. Adherence to Leninist principles of work with personnel, constant attention to raising the skill of workers of all ranks and fields of specialization, and strengthening of labor, state, technological, and financial discipline--all of this must be constantly in the center of attention of economic supervisors and party, trade union, and Komsomol organizations of the fleet and coastal collectives.

The speeding up of scientific and technical progress raises demands on skill of workers and competence of every specialist. The demands of supervisors are to be increased even more. Ideological conviction and moral purity, efficiency and initiative, lofty feeling of responsibility, and exacting nature and attention to people--these and many other qualities are now necessary for supervisors of collectives. The April (1985) plenum of the CPSU Central Committee stressed that in places where the Leninist principles of selecting, assigning, and training personnel are violated and where promotion of workers is allowed on the basis of personal devotion, servility, and protectionism, there an inevitable fading of criticism and self-criticism and weakening of ties with the masses occurs and results in failures in work.

The course toward speeding up scientific and technical progress also contemplates a new approach to solving social problems. It is necessary to utilize as broadly and fully as possible everything that can exert influence on reducing the turnover and retaining personnel in labor collectives, and in particular consolidating the rights which were granted by the Law on Labor Collectives.

Today, there is a need for stepped up work at all sectors of the national economy for the purpose of speeding up socioeconomic development of the society of mature socialism and strengthening the defensive and economic might of our motherland. All efforts of maritime transport workers must be directed at successful solution of this task which is of enormous political importance.



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MARITIME AND RIVER FLEETS

## INSTITUTE'S ROLE IN ICEBREAKER SHIP DEVELOPMENT

Moscow MORSKOY FLOT in Russian No 10, Oct 85 pp 39-40

[Article by O. Faddeyev (AANII): "Improving the Ice Qualities of Ships"]

[Text] The Laboratory of the Ice Qualities of Ships of the Arctic and Antarctic Scientific Research Institute was founded in 1935, that is 15 years after the founding of the institute. It is engaged in the study of the ice qualities of icebreakers and ice navigation transport ships, which are designed for operation under ice conditions of the Arctic and the freezing non-Arctic seas.

An entire complex of qualities of an icebreaker or a transport ship is understood under the term "ice qualities," including the ability to overcome ice resistance (consolidated pack ice as well as crushed ice) and to move under various ice conditions at a certain desired speed; the ability to absorb ice loads, which have an effect on the hull; the ability of a ship to maneuver in ice; and some other qualities.

The laboratory's scientific activity is developed in three directions: theoretical research and analytical methods; scale-model tests in an experimental ice basin; and full-scale tests of ships under 'ce conditions of the Arctic and the freezing non-Arctic seas. All of these methods are inseparably linked among themselves and mutually supplement and develop each other.

The laboratory was the first in the world to develop methods of modelling the movement of ships in ice and in 1955 built the world's first experimental ice basin, where ice of natural composition is formed. The strength of the simulated ice as well as its thickness correspond to the scale of a model.

During the process of a scale-model experiment in the ice basin, the shape of a hull is worked out and ice resistance and capacity of a power unit are determined, which is necessary for overcoming a given thickness of ice or the thickness of ice which a ship can overcome with given lines of a hull and capacity of a power unit. Basins after the model of the AANII basin have now been built in the United States, Canada, Finland, the FRG and Japan.

During 30 years of operations, more than 150 various models of icebreakers and transport ships were tested in the AANII ice basin. The line shapes of almost all domestically built icebreakers were worked out, including the nuclear-powered icebreakers Lenin and Arktika (now Leonid Brezhnev), many transport

ships, river icebreakers and tugboats, fishing vessels, and so forth. Research has made it possible to improve the methods of preparing simulated ice and to work out methods and techniques of a scale-model experiment as well as to conduct an experimental check of the possibility in fulfilling the conditions of a similitude.

The following scale-model tests according to methods developed in the AANII are conducted in the ice basin: towing (a model is pulled across the ice with the aid of a special device) and self-propelled (a model moves with the aid of its own screws). All of these tests can be conducted in a field of consolidated pack ice or crushed ice.

By the time the ice basin was ready to be put into operation, a group of associates of the AANII's Laboratory of the Ice Qualities of Ships under scientific supervision of Academician Yu. Shimanskiy and Prof L Nogid have developed basic modelling methods (a theory of similitude of a ship's movement in ice, methods of preparing simulated weakened ice of natural composition, and experiment techniques) as well as equipment and facilities of the ice basin.

Despite various methodical difficulties and the limited size of the world's first ice basin, a large volume of fundamental scientific research and experimental work was conducted in it in 30 years, including on orders of the MMF and industry.

Work in the ice basin is conducted in three interrelated directions: improving modelling methods, developing methods for calculating ice swiftness, and solving practical questions of designing and operating icebreakers and ice navigation ships.

Besides scale-model test methods, the laboratory has developed analytical relationships with whose aid it is possible to determine ice resistance during the initial designing stage of ships and in the process of their operation in ice.

A great role in determining the ice qualities is played by full-scale tests of icebreakers and transport ships under ice conditions of the Arctic, the Antarctic and the freezing non-Arctic seas. Since 1947, the laboratory has been conducting systematic full-scale tests of icebreakers and ships in the Arctic and other freezing water areas in accordance with a comprehensive program.

Full-scale studies of the ice qualities of ships include several kinds of tests: ice swiftness, ice strength, maneuverability in ice, various systems and equipment designed for improvement of the ice qualities of ships, and so forth. The results obtained in the ice basin are checked during full-scale tests.

Besides questions of ice swiftness, the laboratory studies the questions of ice strength of the lining and framing of ice navigation ships. The laboratory has developed a method for determining ice loads on a ship's hull, which occur during direct and reverberatory impact against ice, ice compression, and so forth.

Great attention is devoted to questions of strength of ice navigation ships, since in it is the key to accident-free fleet operations under ice conditions.

All basic calculations of the structural strength of ships with regard to determining ice loads are carried out with the aid of computers. Broad strain measurements of hull bonds are conducted during full-scale tests of icebreakers and ice navigation ships in order to determine the stress which arises in the framing and lining of ships during the effect of ice loads. Necessary improvements are made based on the strain measurement results.

The USSR Registry Regulations currently in force with regard to classification and building of icebreakers and ice navigation transport ships were developed on the basis of the laboratory's full-scale tests and theoretical studies. Introduction of these regulations in the icebreaker building practice has led to conservation of metal, ensurance of necessary hull strength of ice navigation ships, and reduction of the accident rate, and consequently to an increased efficiency in the utilization of icebreakers and ice navigation ships.

There is still another work of the laboratory which is of great economic significance for the national economy--the compilation of the so-called ice certificates for ice navigation ships. By using the aforementioned certificates in the practice of transport fleet operations under ice conditions of the Arctic or freezing non-Arctic seas, shipping companies can justifiably assign ship movement speeds under various ice conditions, and captains, by being aware of possibilities of their ships, can avoid ice injuries and accidents. This work of the laboratory has received a positive response from all interested organizations.

The effectiveness of the laboratory's activity is determined by practical introduction of its work results--their utilization in new designs of icebreakers and transport ships, during establishment of regulations for classification and building of ice navigation ships and during operation of ships in ice as well as during publication of monographs and collections of articles.

During the past 20 years, the laboratory has created six monographs and three collections of works, which cover all aspects of a ship's interaction with ice, including "Screw Propellers of Ice Navigation Ships," "The Strength of Ships Operating in Ice," "Ice Resistance to Ship Movement," "Dynamics of the Ice Cover," "Icebreakers," and "The Sea Ice."

Experimental work in the experimental ice basin and development of scale-model test methods have led to development of a method for determining the form of lines of ice navigation ships with respect to ice swiftness as well as to ensuring ice strength.

It is significant that all work of the laboratory is rapdily introduced into practice. Recommendations made by the laboratory have been used in almost all domestically prepared designs of icebreakers, which have been built in the Soviet Union and abroad for the Soviet Union. For example, the model of the nuclear-powered icebreaker Arktika (several versions) was tested very carefully and thoroughly in the ice basin of the AANII and the laboratory's recommendations with regard to the form of lines of its hull were introduced into the plan.

Thus, specialists of the AANII's Laboratory of the Ice Qualities of Ships have contributed their share to the success of the Arktika's historic voyage to the North Pole and to the experimental high-altitude voyage of the nuclear-powered icebreaker Sibir. During the period of these voyages, expeditionary groups of laboratory associates conducted full-scale tests.

In addition to developing methods for calculating ice swiftness and ice strength, the laboratory has developed a method for designing screw propellers of ice navigation ships. This method was used to design screw propellers of several large icebreakers.

During the past several years, the collective of the laboratory has been working, in addition to everything else, on an important comprehensive subject which is devoted to technical and economic substantiation of promising new kinds of ships. During fulfillment of this subject, laboratory specialists have tested in the ice basin several models of large-tonnage active ice navigation transport ships, calculated the ice strength of these vessels, recommended the form of hull lines, and developed an analytical method for calculating their ice performance.

Laboratory specialists have developed and continue to improve methods for calculating ice loads on hulls of ships so that ice navigation ships would successfully fulfill their purpose, would operate without breakdowns under corresponding ice conditions, and their speeds in ice would fully correspond to the speeds of large nuclear-powered icebreakers. The use of these methods as applied to calculations of strength of ice navigation transport ships makes it possible to bring into full conformity the so-called permissible and attainable ship movement speeds in ice, thereby ensuring the necessary strength of ship hulls for movement at any desired speed.

Ice conditions in the Arctic and freezing non-Arctic seas are highly unstable; therefore determination of ice resistance to ship movement and ice loads, which effect a ship's hull, is a very complex task.

The activity of the Laboratory of the Ice Qualities of Ships is directed at ensuring efficiency and safety of Arctic navigation and at improving ice qualities of icebreakers and ice navigation ships. The laboratory's primary customers are various organizations of the Ministries of the Maritime Fleet, the Shipbuilding Industry, the River Fleet, the Fish Industry, and others.

Maritime transportation is faced with new, great tasks--expanding navigation periods in the Arctic to year-round, ensuring prospecting work on Arctic sea shelves, and mastering high-latitude routes for through shipments between ports of Asia and Europe. To solve these tasks it will be necessary to have new powerful icebreakers and ice navigation ships which correspond to them. The AANII's Laboratory of the Ice Qualities of Ships is already participating most actively in developing this fleet. Its specialists are being assigned to icebreakers and transport ships in the Arctic annually to study questions of ice swiftness, ice strength, and ice navigation conditions. At the beginning of the next five-year plan, the laboratory will receive a new, modern ice experimental basin, which will make it possible to test models of large-tonnage ships and high-power icebreakers, increase the volume of research, and improve modelling methods.

Admiral S. O. Makarov, creator of the world's first icebreaker Yermak, said in 1897: "...No other nation is interested in icebreakers as much as Russia. Nature has locked our seas in ice, but technology now provides tremendous means and it must be admitted that at the present time the ice cover no longer poses an obstacle to shipping."

These words, which were expressed more than 80 years ago, reflect most accurately the situation at the present time, when nuclear energy, which is directed at peaceful aims, helps us in mastering the Arctic. However, it must always be borne in mind that the Arctic has been mastered but not tamed and that the harshness of ice elements has not been reduced at all in the age of scientific and technical revolution. We have learned to navigate in ice, but even the most powerful modern icebreakers are often helpless when faced with raging ice elements. Therefore, it is necessary to study ice conditions of the Arctic and ice, as an environment which hinders shipping, more intensively and to provide proper and increasingly high ice qualities for icebreakers and ice navigation ships as well as to develop new non-icebreaker means for crushing and overcoming ice.



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EXPERIMENTAL SYSTEMS

# TRANSPROGRESS CHIEF ON PNEUMATIC CONTAINER TRANSPORT RESEARCH

Moscow NEDELYA in Russian No 2, 6-12 Jan 86 p 3

[Interview with A. M. Aleksandrov, Honored Inventor of the USSR and chief of the RSFSR Transprogress [Industrial Association for Pneumatic Tube Container Transport] by B. Konovalov under the "Addressed to the 21st Century" rubric: "Air Drives the Trains"]

[Text] It sounds unusual, perhaps, but it is true: we are already working today for the 21st Century--machines with which we will have to work in the next century are being developed, and plans are being worked out which will only be completely implemented in 15 to 20 years. The 20th century is extending its hand to the 21st century... This is why we decided to call our new rubric "Addressed to the 21st Century."

The plan of the Basic Directions for Economic and Social Development of the USSR for 1986-1990 and the period up to the year 2000 calls for further development of industrial transport, including pneumatic container transport. This is our domestic invention. As a matter of fact, the well-known pneumatic mail concept, in which air drives smooth "capsules" holding letters through polished tubes, was developed here. Soviet inventors have put the "capsules" on wheels and devised special seals, and now not lightweight letters, but any freight, even that weighing many tons, can be carried by air pressure through tubes at the speed of the metro. In 1975, the SKB [special design bureau] "Transprogress" was established to implement this scientific and technical concept. And in 1983, the Republic Industrial Association for Pneumatic Tube Container Transport, Transprogress, attached to the RSFSR Council of Ministers, was organized on its basis to intensify work in this direction. At our request, the chief of the RSFSR Transprogress, Honored Inventor of the RSFSR A. M. Aleksandrov, describes how work in the new association is proceeding and what operations are being planned for the future.

"Development of intraplant pneumatic container systems is now proceeding the most successfully," says A. M. Aleksandrov. "It seems that the time has passed when we were only amazed that an artificially created drop in pressure of just 0.1 atmosphere is able to move rather heavy components by tube, and now managers of many industrial sectors are beginning to realize how advantageous the new form of transport is. The systems in operation are visually convincing of this.

"For example, a pneumatic container transport system has been set up at the Penza "Zavod imeni Frunze" Production Association which connected the preparatory, galvanizing, and machine shops and the assembly belt for bicycle production. Essentially, this is a huge transport robot which operates reliably; all materials handling operations have been automated with a special manipulator. As a result, the degree of mechanization in transport and warehousing operations has been increased at the plant from 52 to 90 percent!

"It turned out that in a little over a year the system pays for itself. And not only because of such obvious factors as the release of persons and substitution for battery-operated trucks, but because of the safety of transporting freight in closed tubes as well. To the surprise of the plant management, they began stocking more bicycles without turning out additional parts. But of course, the principal gain was obtained by increased regularity in the operation of the plant's assembly line. Parts now go directly for assembly without any auxiliary stocks. At the dispatcher's order, any needed freight can be delivered literally in a minute. The extremely severe winter of 1984-1985 demonstrated the special advantage of pipeline transport, which functioned reliably in the freezing weather.

"The RSFSR Transprogress is now cooperating successfully with a number of ministries, and in the 12th Five-Year Plan we will be making dozens of pneumatic container systems for different enterprises in the country. We manufacture and assemble all the units ourselves, and only in the final stage do we instruct the plant brigade of operators. This is not a simple job, because one plant is not like another, and a pneumatic transport system must be 'inserted' into an operating enterprise. As a matter of fact, transport operations are being mechanized. A materials handling manipulator, capable of accommodating loads of 600 kilograms, has already been developed in our special design bureau for this, and a new one to handle 1,200 kilograms has been devised. These manipulators link the new intershop plant transport with the existing intrashop transport.

"We are also developing interplant systems. For example, a system is being set up in Nizhnekamsk in which output will be sent from the synthetic rubber plant for a distance of 8 kilometers through a pipe by pneumatic train directly to the tire plant. The rubber is now being shipped by railroad for 20 kilometers, and loading and unloading is practically done manually. Now a mechanized system will directly link the production lines of the two plants."

[Question] Tell us, please, how is work with the larger systems, intended for shipping sand and gravel from quarries, proceeding?

[Answer] We still have to consolidate our positions here and try to gain the prestige that was undermined through no fault of the designers. So the second section of the extended "Lilo-2" system was built with many substantial deviations from the design. Thus far the defects have not been eliminated, and until this is done, the "Lilo-2" basically cannot provide the planned capacity.

There has been much discussion about the 3-kilometer Tula system, which links the Berdnikovskiy quarry and the asphalt concrete plant. The RSFSR Ministry of Highways has been operating it, and accidents have been occurring all the time. The ministry even raised the question that the system was defective and should be dismantled. Then we asked that it be transferred to the RSFSR Transprogress for operation. This was done in the second quarter of 1984, and since then the system has been operating reliably. Maintenance personnel have been reduced from 29 to 7. And the same persons are working as before; only the manager has been replaced. True, the system is operating only on one shift, at one-third of its capacity, because it has now turned out that the quarry is not in a position to provide it with a full workload.

In the 12th Five-Year Plan, we have to start several such systems. While previously they were made by a dozen different plants and this could not help but affect quality, now we hope to manufacture them entirely at our own experimental facility and operate it ourselves on a cost accounting basis. Second-generation units have already been developed at the RSFSR Transprogress; they are more economical and reliable in operation, and the new pneumatic cars [pnevmovagony] will be able to carry heavier loads. But the association does not have a planning organization yet, unfortunately, and this is impeding the work.

[Question] What is preventing the scope of pneumatic container transport use from being expanded?

[Answer] There are many reasons. One of them is the significant difficulties we continuously encounter. Of the two plants promised by the RSFSR Gosplan, which were supposed to be reconstructed and oriented toward production of our equipment, we received one--the Kursk "Kommunar." It was turning out zinc-coated barrels. Reconstruction is now under way, and by the end of the 12th Five-Year Plan it should be producing output for the pneumatic container systems valued at 20 million rubles annually. This plant will be specialized for intraplant systems.

There is still one reserve not being utilized by us--a cooperative with those machine building ministries for which we are making the intraplant systems. They could take over the manufacture of part of the equipment. This would sharply accelerate the rate and scope of introduction and would yield immense economic gain.

In the 13th Five-Year plan, it is planned to build a new plant in Derbent for turning out large systems. We are now manufacturing equipment for such systems at the experimental facility of the RSFSR Transprogress SKB in Orekhovo-Zuyevo--the main base of our association. The facility has been

expanded greatly, and could be separated completely into an independent pilot plant; with minor reconstruction here it is fully workable to increase output by five times as much. It is expedient to establish a specialized installation and checkout administration here as well. But we have not obtained the consent of the Moscow Oblispolkom so far, and the problem should be resolved more quickly.

[Question] If you look into the future, what trends that you are still developing appear promising?

[Answer] Removing everyday refuse from the cities is an immense problem for the entire world now. And pneumatic container systems can be very useful here. The first test has already been conducted in Leningrad. True, the construction workers must still clear away unfinished work in laying the cable for the control system, and then the system will operate automatically. But it is now serving about 100,000 residents of Leningrad's Moskovskiy Rayon. Pneumatic trains carry household refuse through an 11-kilometer pipeline to a garbage processing plant. At the "reception point" it is taken away by garbage trucks. In the new Shuvalovo-Ozerka microrayon of Leningrad which is under construction, a vacuum system is already replacing them: all household refuse will arrive at a collection point automatically by pipelines. It is planned to develop five such systems in Leningrad in the future.

Moscow, unfortunately, is lagging behind in this regard, which is unwise. Automatic transport of household refuse which does not pollute the environment will unquestionably become as necessary as a sewer system and a water pipeline. And it should be established right now in all new cities and microrayons under construction. We must show foresight. None of the large-capacity garbage trucks on which hopes are placed at times will resolve this problem effectively. Pneumatic container transport can compete successfuly with dump trucks and the railroad for short distances everywhere a constant, stable flow of freight is required. If one dreams a little... We can picture extensive use of pneumatic trains in building tunnels and dams, for taking rock out of quarries. We have developed mobile prefabricated systems which can be easily carried from place to place. The scope for using pneumatic container transport is immense. We are taking the first steps now. But it is now already clear that such transport may be used extensively in all sectors of the national economy.

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